The Electrical Industry's Weekly Magazine

April 13, 1959

Electrical World

Price 50 Cents

A McGraw-Hill Publication

Connecticut Light & Power Success Story: Street Lighting Revenue Doubles in 6 Years

...page 72

Alabama Power Co Wins Edison Award ... p 66

STEVENS RICE GS
UNIVERSITY MICROFILMS IN
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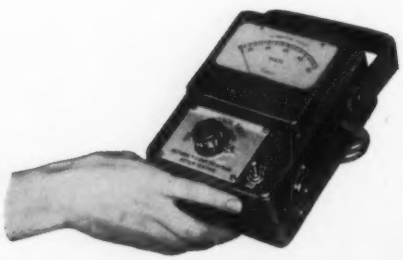
ANN ARBOR MICH

ALLIS-CHALMERS modern line for '59

. . . simpler regulator control

- **Provides more accurate settings**
- **Saves operator's time**
- **Eliminates customer complaints**

Now when you adjust or test voltage level and band width there's no need to change customer voltage. No more customer complaints of high or low voltage. With *Caliband* control the job is simpler than ever before. Adjusting a single knob is all it takes . . . operator's time for accurate settings is greatly reduced.



CALIBAND control demonstrated

Caliband control is so simple it can be demonstrated and explained at your desk with an actual unit in a small portable kit. Contact your nearby A-C office for a demonstration, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

Caliband is an Allis-Chalmers trademark.

ALLIS-CHALMERS
Originators of 5/8% Step Regulators

A-5912

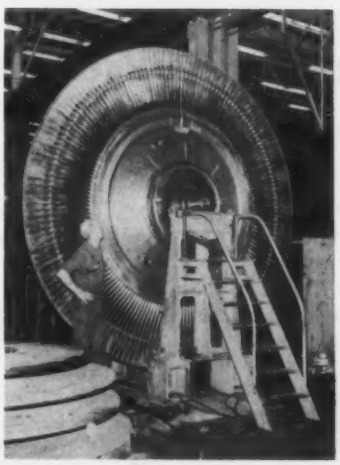
Electrical World

Vol. 151, No. 15 APRIL 13, 1959

Published for 85 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

In This Week's Issue

p 72



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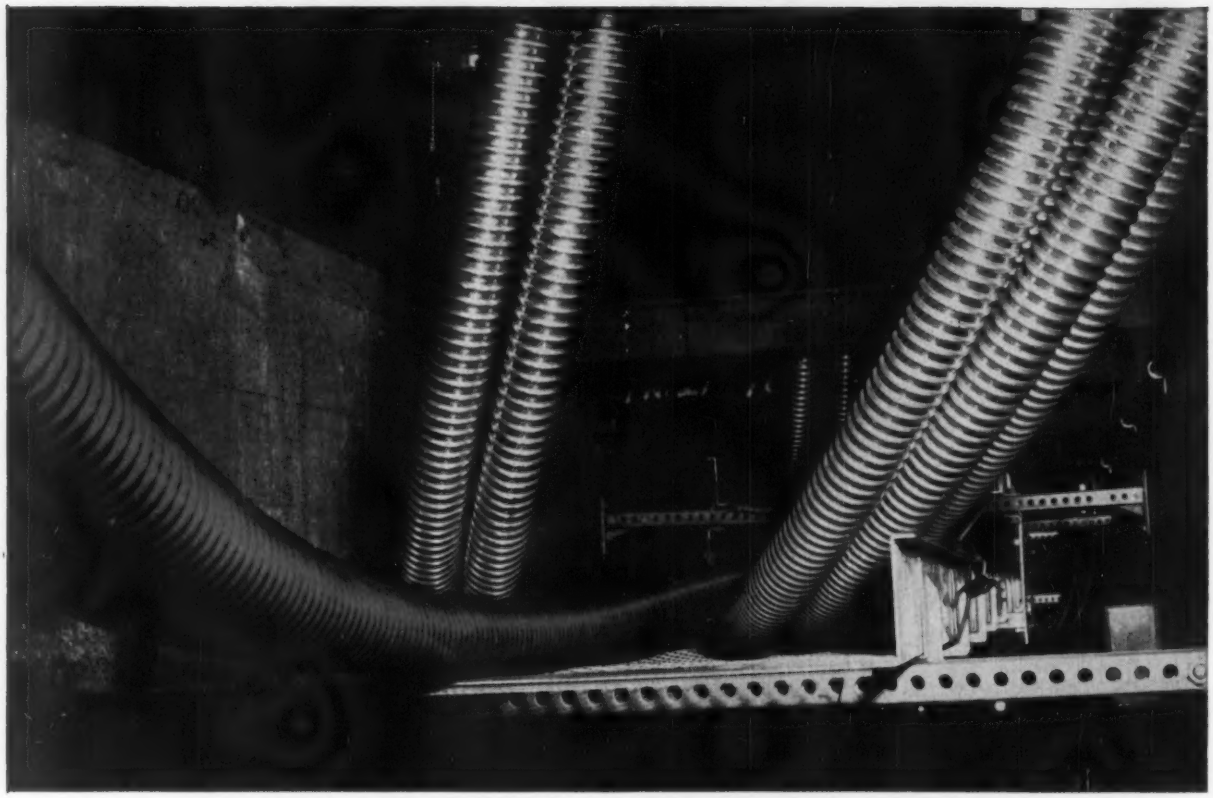

Quick identification for high voltage primaries is provided by an Okonite-developed, baked-on enamel finish in bright orange. In this access tunnel below transformer enclosure 3/c 15kv Okonex primaries are laid in same tray with 3/c 600v Okonex secondaries with plain aluminum Loxarmor. Plant and electrical system were engineered and designed by Southwestern Engineering Company. Electrical contractors were Trowbridge & Flynn Electric Company.

"Power supply is vital," said Diamond Gardner Corp. "We furnished Okonite cables," said Del E. Webb and SWECO

Here was an ultra-modern, completely integrated manufacturing operation where power failures could trigger a costly "chain reaction" in down time. That's one reason why Del E. Webb Construction Company and Southwestern Engineering Company furnished Okonite cables for extensive use in the new and unique mechanical pulping mill for Diamond Gardner Corporation's Integrated Forest Products Center at Red Bluff, California.

Another reason was SWECO's knowledge that The Okonite Company, because it alone makes cables by all methods, is uniquely qualified to help select the best cable for a specific circuit . . . and manufacture it to suit any installation conditions.

All primary and secondary power and control circuits in the plant are Okonite cables. For example: lightweight Okonex-insulated Loxarmor primaries, identified by an Okonite-developed bright orange, baked-on enamel finish, carry all power at 12kv to the twin transformer vaults in the plant. 600-volt Watertite-Loxarmor, 600-volt Okonex-Loxarmor and 5kv Okonex-Loxarmor, in racks, were selected for secondary distribution for their flexibility, low installation costs and the ease with which circuits can be added or re-routed. 600-volt Okotherm control cables were specified for circuits where high heat conditions are encountered.

Okonite quality . . . Okonite's ability to build cables by any method . . . and Okonite's expert design and installation assistance are factors to consider when ordering or specifying cables for your important installations. For more data on Loxarmor, write for free, 36-page Bulletin EW-1090, The Okonite Company, Passaic, New Jersey.

where there's electrical power . . . there's **OKONITE CABLE**

6214

Our Competition Is Doing Very Well

Today, according to E. O. George, Chairman of the Sales Division of the Edison Electric Institute, the industry does not look very good. He gave these statistics at the recent Southeastern Electric Exchange meeting:

"During 1948, we outsold gas dryers 5 to 1 whereas today we are outselling gas only about 2 to 1. And in many large metropolitan areas where gas competition is greatest we are actually being outsold.

"In 1948 there were three gas water heater sales to every two electric. Today this ratio has grown to more than six gas for every two electric.

"By projecting range, dryer, water heater and other sales on the basis of apparent trends, we may find that net growth will be considerably—yes, considerably less than we want—and electrical revenues much less than we need.

"To put it bluntly, we cannot double kilowatthour use during the next ten years without aggressive promotion of electric space heating."

These statistics, picked at random, tell their own story. They simply say, without the emphasis given by Mr. George, that some members in our industry still think too much of gas and too little of electricity. And others let well enough (in their opinion) alone.

Fischer Black

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RIGHT FROM THE START

When piping costs come close to the million mark — when the installation is vast, and the leeway for error is small — a piping job must be right from the start to finish. Grinnell assures this through complete one-company control and responsibility. From interpretive engineering — through exclusive methods of prefabrication and testing of pipe and hanger units — to precision assembly and delivery, the job is all done by Grinnell, as only Grinnell can do it. The result: installations of any size, at costs known before you start, with assured performance. Grinnell Company, Inc., Providence, R. I.

Current Grinnell piping responsibilities.

Enrico Fermi Atomic Power Plant, Michigan; Ohio Power Company, West Virginia; National Aniline Division of Allied Chemical & Dye Corporation, Virginia; Memphis Light, Gas and Water Division, Tennessee; Aluminum Company of America, Indiana; South Carolina Electric & Gas Company, South Carolina; Duke Power Company, North Carolina; Union Bag-Camp Paper Corp., Virginia; Pennsylvania Power & Light Company, Pennsylvania; Holyoke Water Power Company, Massachusetts.

ANOTHER GENERAL ELECTRIC ***Kilovar Plus...***

STAINLESS-STEEL Capacitors by General Electric Eliminate Repainting, Cut Maintenance Costs

W. G. HART, *Manager—Power Capacitor Sales, points out G-E capacitor corrosion-resistant feature.*

GENERAL ELECTRIC STAINLESS-STEEL CASE POWER CAPACITORS eliminate leaks caused by corrosion or rust, keeping bothersome inspections and costly maintenance to a minimum. You can use G-E capacitors to supply kilovars anywhere, regardless of atmospheric conditions. They are not affected by corrosive salt-water spray found along coast lines and resist chemical agents in industrial areas.

NO PAINT MAINTENANCE IS REQUIRED, either. This means substantial savings for you. For example, many utility engineers estimate that capacitors with ordinary case material have to be taken off the pole or out of racks for repainting at least once or twice during their service life, at a cost of $8 to $10 per repainting. Because G-E stainless-steel capacitor cases require no protective repainting, you get a direct savings in system maintenance.

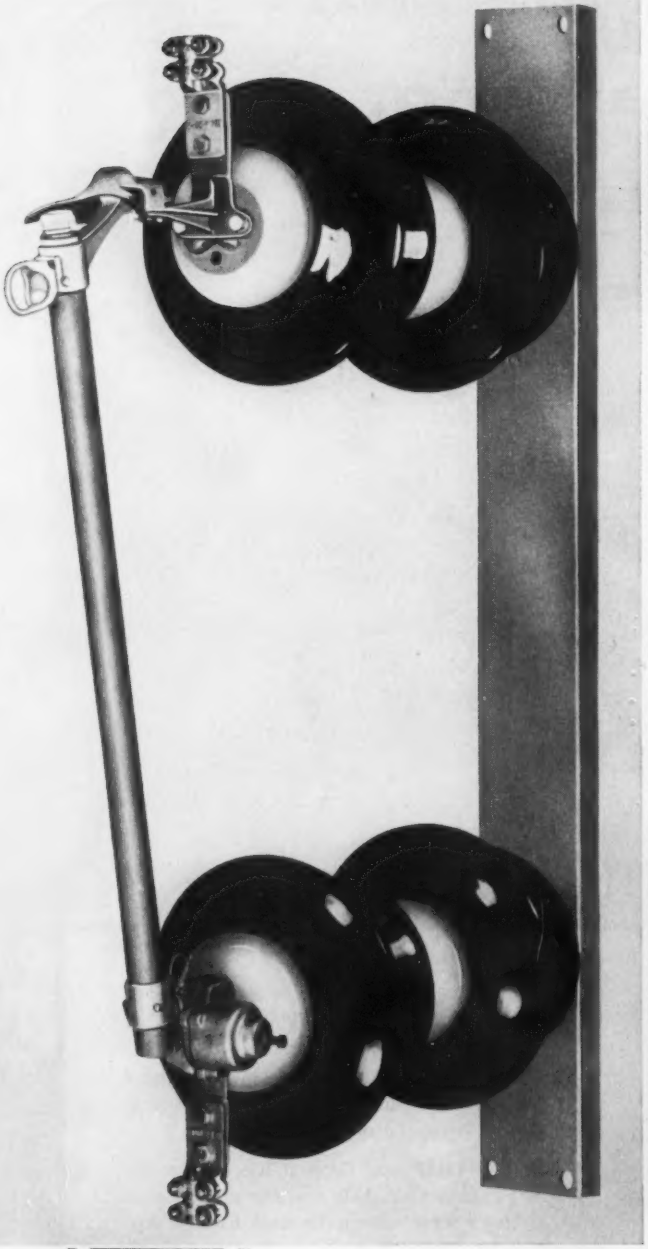
THE STAINLESS-STEEL CASE is a standard feature of all G-E 25 and 50-kvar power capacitors and 3, 5, and 7.5-kvar residential secondary capacitors.

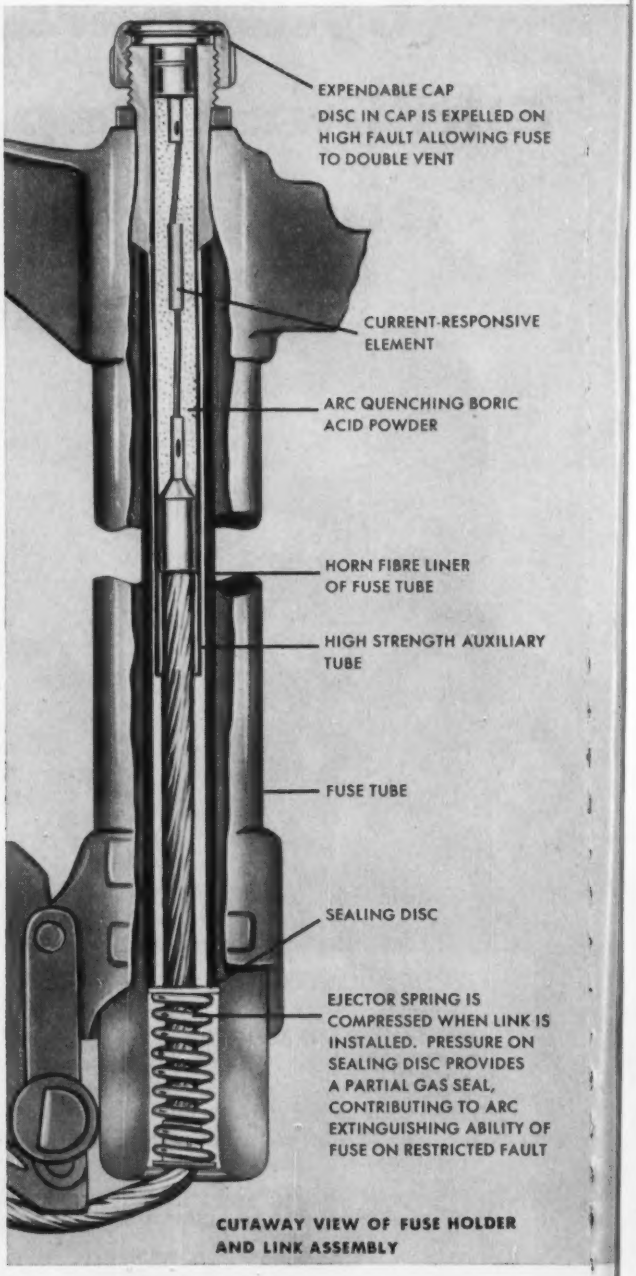
SEE FOR YOURSELF how General Electric's stainless-steel capacitors can help you cut maintenance costs. Contact your nearest General Electric Apparatus Sales Office, or write to Section 445-25, General Electric Co., Schenectady 5, N. Y.

Progress Is Our Most Important Product

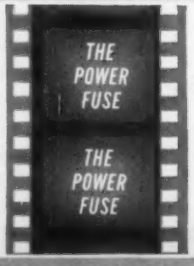
GENERAL ELECTRIC

A Reliable New Family of F




EXPENDABLE CAP
DISC IN CAP IS EXPELLED ON HIGH FAULT ALLOWING FUSE TO DOUBLE VENT
CURRENT-RESPONSIVE ELEMENT
ARC QUENCHING BORIC ACID POWDER
HORN FIBRE LINER OF FUSE TUBE
HIGH STRENGTH AUXILIARY TUBE
FUSE TUBE
SEALING DISC
EJECTOR SPRING IS COMPRESSED WHEN LINK IS INSTALLED. PRESSURE ON SEALING DISC PROVIDES A PARTIAL GAS SEAL, CONTRIBUTING TO ARC EXTINGUISHING ABILITY OF FUSE ON RESTRICTED FAULT

CUTAWAY VIEW OF FUSE HOLDER AND LINK ASSEMBLY



Don't miss this sound movie in full color..."The Power Fuse"

It is available, without cost, for viewing by anyone interested in power fuses. On-the-spot results of field tests conducted in conjunction with a leading utility. Factual, informative, well worth your time. Contact your Southern States representative to arrange a showing, or write direct to the company.

Power Fuses by Southern States

- POSITIVE CLEARANCE OF RESTRICTED FAULTS
- HIGHEST INTERRUPTING RATINGS AVAILABLE
- WIDEST RANGE OF SELECTION
- SIMPLIFIED CONSTRUCTION

Reliable performance—to provide dependable protection against high or low fault currents—is one of the most important requirements demanded of power fuses by engineers. With this uppermost in mind, we developed our new family of power fuses.

Extra reliability in clearing restricted faults is provided by the new, dual-operating characteristics of the expendable cap and arc-quenching boric-acid fuse link.

Extra reliability in handling high faults is provided by the double-venting action, fibreglass tubes and other design features—resulting in interrupting ratings approaching 3½-million kva at 161 kv.

A wider range of selection permits adequate fusing without buying excessive interrupting capacity.

The expendable cap and the sealing disc at the lower end of the fuse prevent the entrance of moisture or extraneous matter. Patented electrostatic shielding eliminates corona damage. A built-in snubber brings the fuse holder to a cushioned, shock-free stop. All in all, this rugged new family of power fuses is engineered to provide completely reliable service for many years.

Get the full story from your Southern States representatives, or write for Bulletin 59PF.

RE-FUSING IN THE FIELD IS QUICK WITH SOUTHERN STATES FUSE KITS

Economical fuse kits, with all of the components necessary for re-fusing in the field, are available for all Southern States Power Fuses. Four speed ratios—clearly marked, compact packages.

PIONEERS IN POWER FUSES SINCE 1924

SOUTHERN STATES EQUIPMENT CORP.
HAMPTON, GEORGIA

IN CANADA: Dominion Cutout Co., Ltd., Toronto

NEW UTILITY STATIONS, C-E EQUIPPED

Includes only new stations on new sites placed in operation since JANUARY 1, 1950.

LAKE CATHERINE
HUTCHISON
YATES
DUNKIRK
TITUS
LEE
CONTRA COSTA
HAWTHORN
NINEMILE POINT
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PALATKA
JOHNSONVILLE
DANSKAMMER
BECKJORD
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PLANT X
BLACK DOG
ALBANY
JOPPA
MERAMEC
PORTSMOUTH
LAKE CREEK
ETIWANDA
AURORA
HENNEPIN
EASTLAKE
OAK CREEK
SUWANNEE RIVER
URQUHART
KINGSTON
SANDOW
MULLERGREN
BARRY
NORTH OMAHA
WILMINGTON
CARBON
SAGUARO
MORRO BAY
VERMILION
JOHN SEVIER
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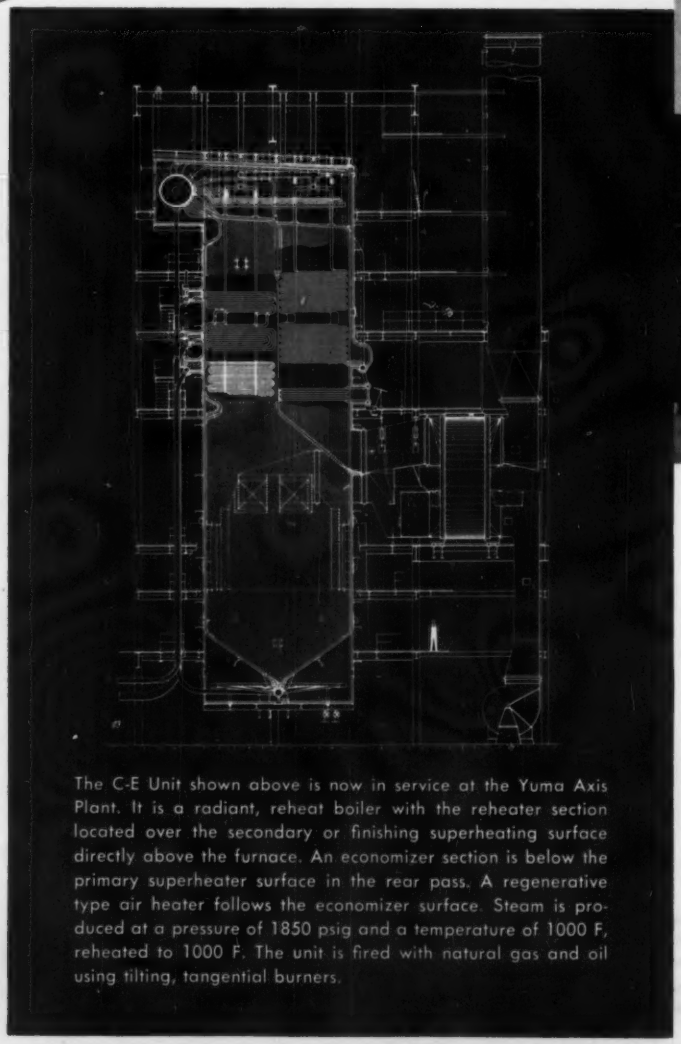
McMEEKIN
LEWIS and CLARK
ROY S. NELSON

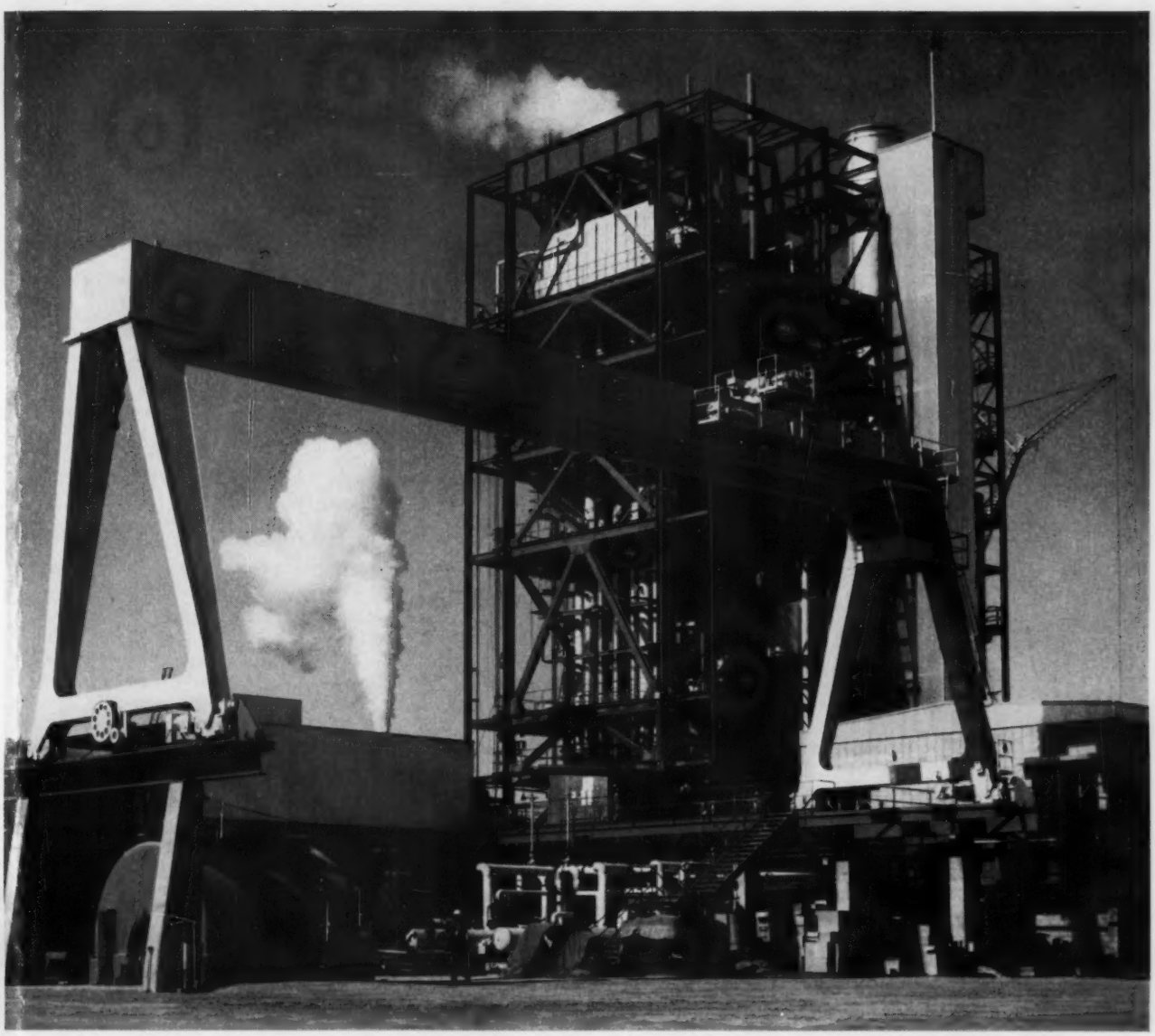
YUMA AXIS

New Yuma Axis Plant

Goes into service



The C-E Unit shown above is now in service at the Yuma Axis Plant. It is a radiant, reheat boiler with the reheater section located over the secondary or finishing superheating surface directly above the furnace. An economizer section is below the primary superheater surface in the rear pass. A regenerative type air heater follows the economizer surface. Steam is produced at a pressure of 1850 psig and a temperature of 1000 F, reheated to 1000 F. The unit is fired with natural gas and oil using tilting, tangential burners.



Unit One of California Electric Power Company's new Yuma Axis Steam Electric Generating Plant was recently placed in operation. The 80,000-kilowatt unit is the first of four units planned for this site to meet the ever-growing power demands of the lower Colorado River basin in Southern California and western Arizona. A second 80,000-kilowatt unit will be erected on the same site by Arizona Public Service Company, and subsequent units by the two utilities as the need arises. Located near the city of Yuma, this modern station of outdoor design was planned and constructed by the Bechtel Corporation under the general supervision of the Calectric and Public Service engineering departments. Its power will be transmitted at 161,000 and 69,000 volts.

The Yuma Axis Plant, so-named because an axis line through the property divides it between the two utilities, is the result of a unique power pool arrangement through which Calectric and Public Service will share output of each unit to meet power demands in their respective service areas.

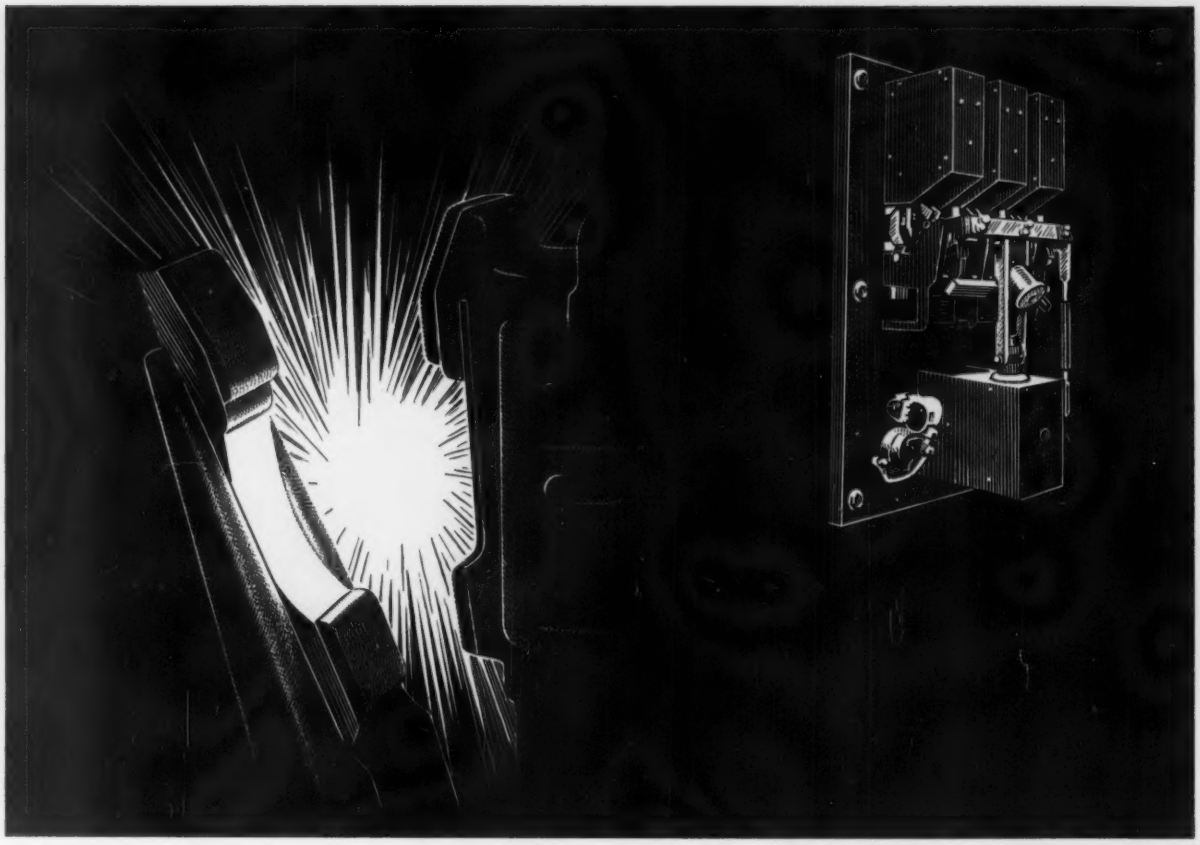
Steam for the new units at Yuma Axis Plant will be supplied by C-E Steam Generating Units, a cross-sectional elevation and brief description of which appear on the opposite page.

COMBUSTION ENGINEERING

Combustion Engineering Building, 200 Madison Avenue, New York 16, N. Y.

C-212

ALL TYPES OF STEAM GENERATING, FUEL BURNING AND RELATED EQUIPMENT; NUCLEAR REACTORS; PAPER MILL EQUIPMENT; PULVERIZERS; FLASH DRYING SYSTEMS; PRESSURE VESSELS; SOIL PIPE



Elkonite® Contacts in Your Switchgear Assure Dependable Service

The performance you get from the switchgear you buy depends to a large extent on the performance of the contacts. Making and breaking high current circuits, with unfailing dependability, calls for contact materials which are engineered for their exacting job, and manufactured to uncompromising standards of quality.

Because contacts are so important, it pays to specify materials that you know you can depend on . . . Mallory Elkonite. The Elkonite process combines metals of high conductivity with metals having high melting points, resulting in a material which utilizes both of these desirable characteristics. From long experience in contact applications, a comprehensive line of materials has been developed in our laboratories. To meet your specific requirements, Mallory specialists control manufacturing processes . . . refractory particle size, methods of pressing and sintering . . . to get the exact hardness, mechanical strength, electrical conductivity and arc erosion resistance.

In thousands of products made by leading manufacturers, Elkonite contacts have earned a reputation for long service and unequalled performance. Make sure you get these qualities, by asking your supplier to use Elkonite.

Serving industry with these products:

Electro-mechanical—Switches • Control Devices
Electromagnetic—Vibrators • Relays • Choppers
Electro-chemical—Capacitors • Batteries • Resistors
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P. R. MALLORY & CO. Inc.
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RT&E Dual Voltage Transformers

RT & E

Introduced the *first* dual voltage transformer with external means of changing voltage.

•

Has the *most* dual voltage units in service.

•

Provides the *widest* variety of voltage combinations.

Since RT&E introduced the industry's first dual voltage transformer three years ago, an increasing number of utilities have joined the pioneer group who first installed these units.

Included among the many utilities who have installed RT&E dual voltage transformers are Commonwealth Edison Co., South Carolina Electric & Gas Co., Puget Sound Power & Light Co., Kansas Power & Light Co., Central Louisiana Electric Co. and Wisconsin Electric Power Co. RT&E has shipped over 5000 dual voltage transformers to these and other leading utilities.

RT&E is proud of the contribution it has made to the electrical industry through the introduction and promotion of the externally operated dual voltage transformer.

Available in all primary voltage combinations: 2400 x 4800 volts, 2400 x 7000 volts, 7200 x 14,400 volts, 4800 x 14,400 volts. Also custom designed to special requirements. See your RT&E representative, or address inquiries to Dept. A., Waukesha, Wis.

RT&E

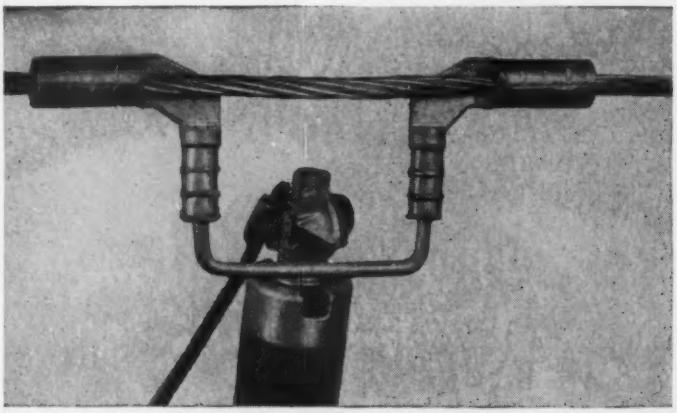
ENGINEERING TALENT CONCENTRATED ON ONE IDEA — A BETTER TRANSFORMER

CORPORATION
WAUKESHA, WISCONSIN
PORTLAND, OREGON

AA

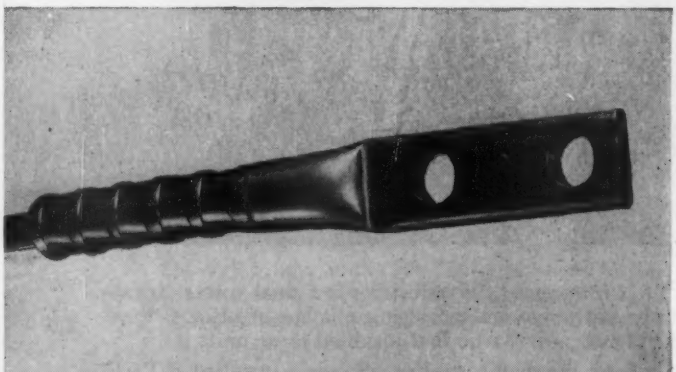
Kearney's compression program

Added versatility and increased application with existing tools—that's what an investment in Kearney Compression can mean for your system. Besides the basic connections—Squeezons, Serv-En Service Entrance Sleeves, Tension Sleeves and others—you receive the advantages of ever widening tool flexibility as Kearney Engineers continue to develop and introduce new Compression Fittings to the field.



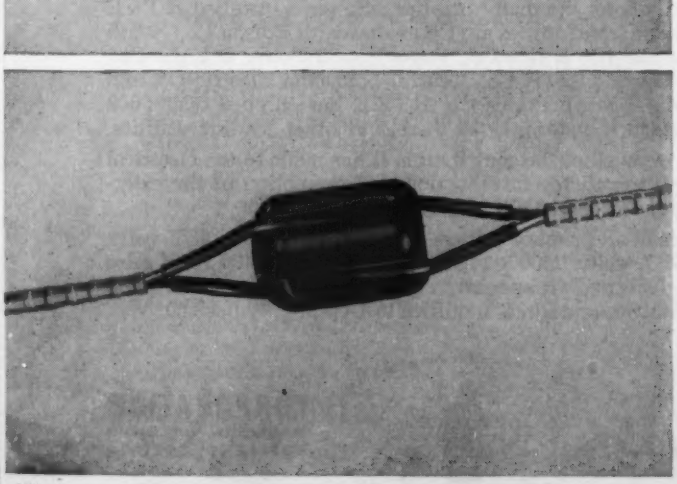
KEARNEY L Squeezon Stirrup

Line side connections are outside the basket—sufficient clearance for either the hydraulic or mechanical tool. The three inch dimension between the line and stirrup makes the unit neat and compact—hot line clamps are readily installed. Unit may be completely covered with line guards.



KEARNEY Compression Terminal

Kearney Compression Terminals provide an efficient method of connecting aluminum conductors to terminal pads. Flaring of strands possible with conventional terminal pads is eliminated. The strands are retained in an aluminum sleeve. Terminals have NEMA 1¾" bolt centers. May also be used as disconnectable jumpers around double dead-ends. The sleeves are filled with Kearnalex Contact Aid and capped and will take conductor sizes from 1/0 to 397.5 MCM 18/1 ACSR.



KEARNEY Insulated Splice

The Insulated Splice was designed primarily for splitting secondaries into shorter sections where additional transformers have been installed and for series street lighting applications. No changes in existing construction are required. Designed for copper, aluminum and ACSR connections, this splice features one piece construction, tension-type sleeves, insulated stainless steel bails and a high strength strain insulator. Splice can be installed with Kearney Hydraulic or Mechanical Tools. ACSR and aluminum sleeves are packed with Kearnalex Contact Aid and plastic capped.

pays extra dividends

KEARNEY INSIDE TAPERED COPPER SLEEVE

A completely new, cost-cutting design—another Kearney "dividend"—permanent, positive, full tension splicing of energized conductors with standard Kearney tools and dies.

ADVANTAGES—

1. **Metallizing process**—copper sleeve is sprayed internally with conductive metal to assure maximum holding power and high conductivity.
2. **Full Inside Taper**—design assures ease of insertion of hot conductors—also relieves stress, due to vibration, at the extremities of the sleeve.
3. **Shorter Length** means less installation time, fewer crimps and no sacrifice of holding power—sleeve is more easily stored.
4. **Clearly marked** with conductor and die sizes.

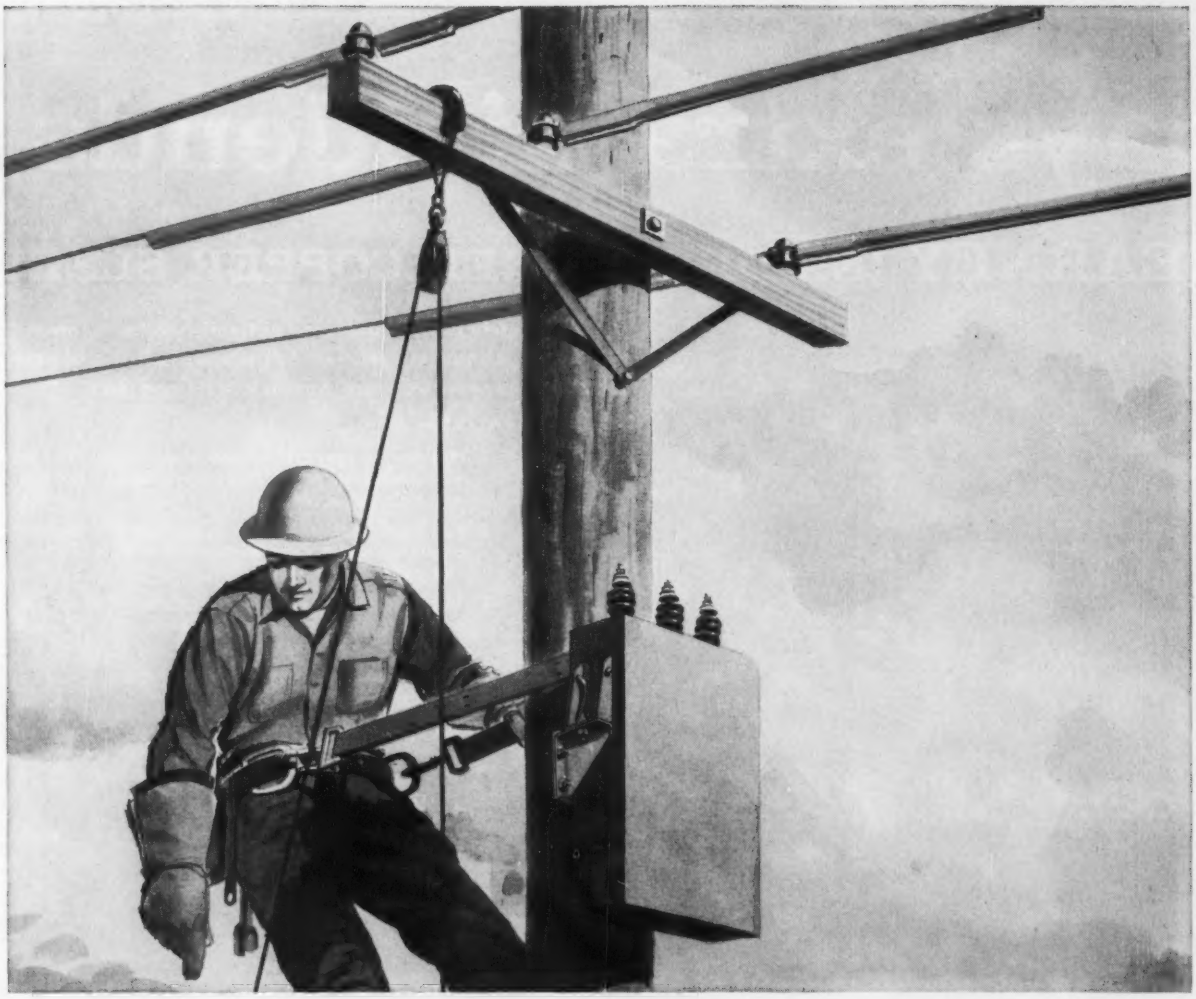
KEARNEY WH-1 TOOL

A rugged, reliable hydraulic tool which expedites the installation of Kearney compression fittings and sleeves. Hi-speed, two-valve pump permits fewer strokes for full compression—exerts 21,000 pounds thrust. The narrow "C" head permits full visibility of the working area. Balanced weight enables the lineman to position the tool quickly and accurately for each indent. Interchangeable, insulated wood handles with extra length are available for working higher voltages.

FOR BETTER CONSTRUCTION—SAFER MAINTENANCE

Specify Kearney Products

PLANTS AT: ST. LOUIS • FAYETTEVILLE, ARKANSAS • SHENANDOAH & CLARINDA, IOWA • GUELPH, ONTARIO, CANADA



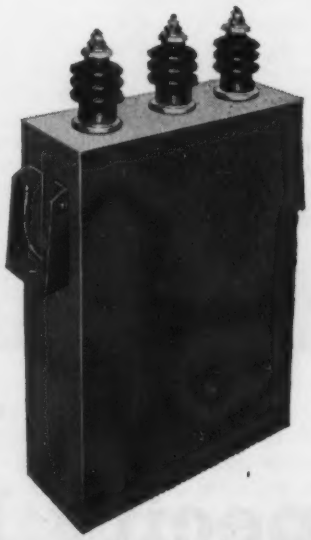
A New Bonus Value From Westinghouse Plowback of Earnings . . .

FIRST 100-KVAR, 3-PHASE CAPACITOR CUTS EQUIPMENT AND INSTALLATION COSTS

Available only from Westinghouse, this new development in 5-kv class capacitors provides a 3-phase installation in a single 100-kvar unit for applications previously requiring three separate single-phase capacitors. Not only does this equipment fill a kilovar gap, but it significantly reduces your investment in materials and installation.

Let us show you how this exclusive Westinghouse advance can mean Bonus Values beyond your specification, in economy and performance.

Ask your Westinghouse representative for details, or write: Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania. J-60933



YOU CAN BE SURE...IF IT'S

Westinghouse

WATCH "WESTINGHOUSE LUCILLE BALL - DESI ARNAZ SHOWS" CBS-TV MONDAYS

You get HIGHER CONDUCTIVITY with BLACKBURN SERVICE ENTRANCE SLEEVES

because Blackburn...and Blackburn alone...provides GREATER CONTACT AREA where needed

Hole Depth Increases With Size of Conductor...thereby providing more contact area for the conductors being connected.

COLOR CODE	WIRE SIZE ACSR	WIRE SIZE AWG	HOLE DEPTH IN INCHES
Brown	–	8 sol — 10 str	.820
Green	–	6 sol — 8 str	.840
Blue	6	4 sol — 6 str	.860
Orange	4	2 sol — 4 str	.925
Red	2	1 sol — 2 str	1.010
Yellow	1/o	1/o str	1.185

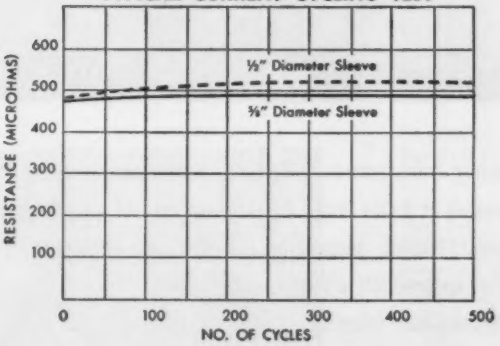
The center stop in a Blackburn Sleeve is a solid barrier that assures proper distribution of the inhibitor around the conductors.

FIRST! Printed (not indented) permanent COLOR CODING is *easier to read*—makes size identification positive and quick.

FIRST! Aluminum Sensitized Tape seals the Blackburn Sleeve's ends. Easy to puncture... and, if a particle of the seal is pushed into the chamber, it is conductive.

FIRST! Each Blackburn Sleeve contains the superior Blackburn inhibitor, Contax, *in measured amount.* Won't squirt out on glove or in face.

Conductivity of Connection PROVED GREATER Than Equivalent Length of The Conductors Being Connected.



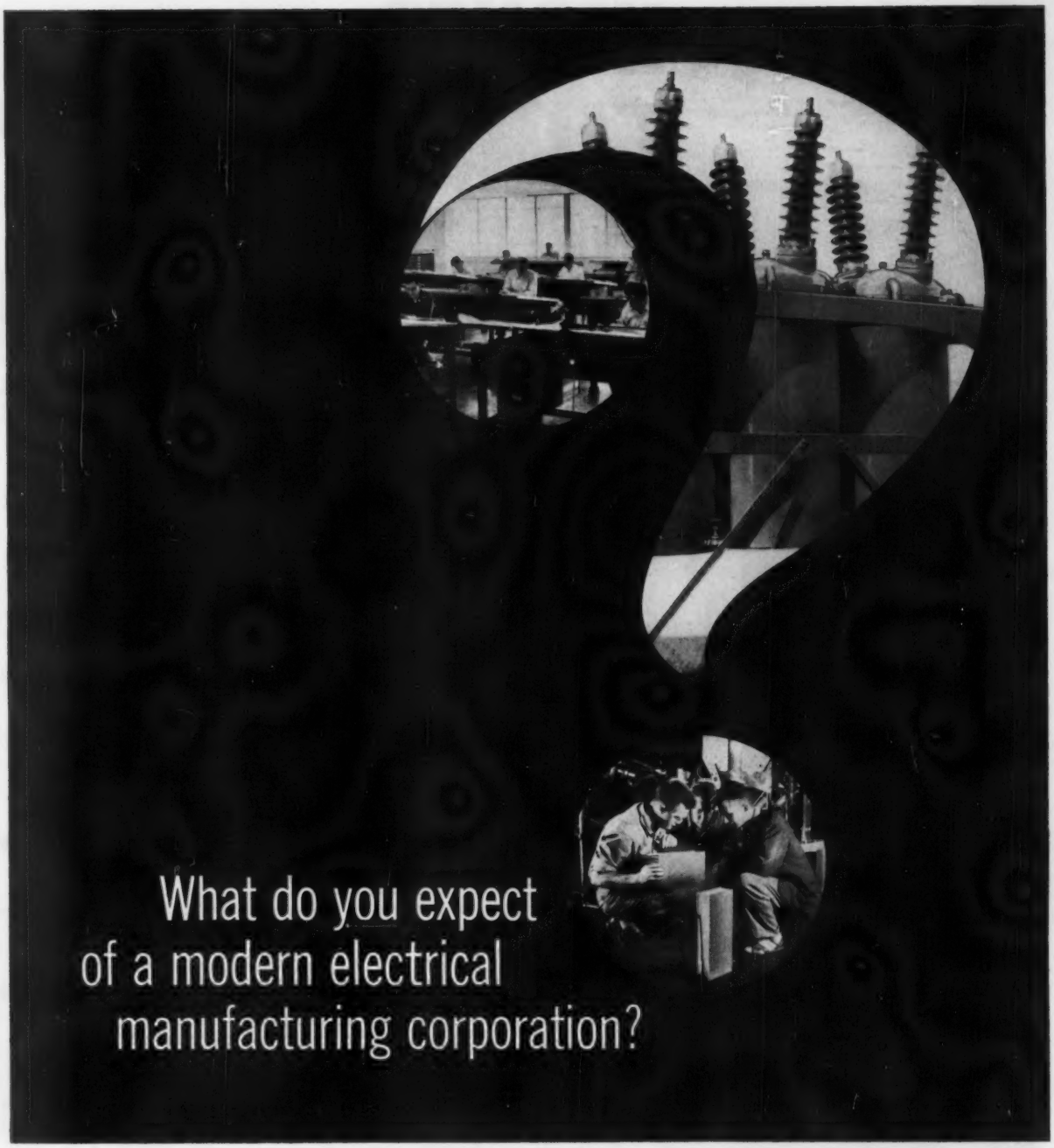
A series of typical current cycling tests were conducted with both ½" x ⅜" diameter BLACKBURN Sleeves. Note the lower resistance of Blackburn Sleeves as compared to the equivalent length of cable without any sleeve.

Test Conditions

Wire: 2 ACSR to 4 stranded copper
Current: 190 Amperes
Cycle: 2 Hrs. "On" 1 Hr. "Off"
Length of Connection: 24 inches
Curves represent an average of five tests
Resistance of equivalent length of wire: 527 Microhms

LIVE BETTER ELECTRICALLY

JASPER BLACKBURN CORPORATION, 1525 Woodson Rd., St. Louis 14, Mo. • WYdown 3-9430



- ☐ A leading manufacturer in its field, professional in every phase of business conduct.
- ☐ Expansion at a rate faster than the remarkable growth pattern of the electrical industry.
- ☐ A forward-looking, soundly built organization working from this growth pattern.
- ☐ Each of its products a leader in its market.
- ☐ A company with integrity.

FEDERAL PACIFIC IS ALL THIS . . . AND MORE

FPE

FEDERAL PACIFIC ELECTRIC COMPANY

The Best in Electrical Distribution and Control Equipment • General Offices: Newark 1, New Jersey

The Electrical Week

LATE NEWS ▶ **EEI elects Allen King president at 27th annual convention** in New Orleans; King is president of Northern States Power . . . Other highlights: Sherman Knapp, Connecticut L&P president, elected vice president; Corette draws USA-USSR power comparison, says Russia is 20 years behind. He also calls for bold PR programs to combat government encroachment; urges utilitymen to get active in politics.

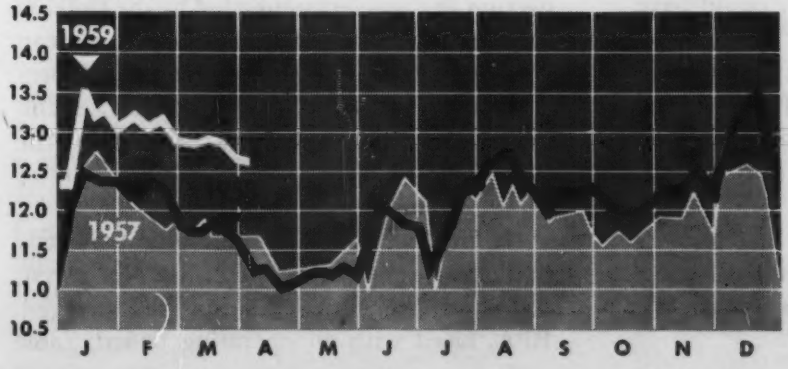
AEC announces breakthrough on A-power-to-electricity conversion with new thermoelectric cell. Unit shows promise for space vehicles, but its use in generating stations is felt to be a long way off by AEC experts, who maintain its thermal efficiency is too low.

Foster Wheeler and North American Aviation announce merger plans on a share-for-share basis. Merger is subject to stockholder approval in both companies. Combined assets of the two would be $396 million.

Washington Wire . . . NRECA's Clyde Ellis predicts new application for Indiana G&T co-op will be filed by mid-April. New loan will be for co-ops only, will not include an aluminum plant as did defunct 1957 application . . . W. A. Dexheimer retires as Commissioner of Reclamation May 1 . . . A. J. G. Priest, special attorney for EEI, files brief before Securities & Exchange Commission arguing SEC has no authority to "reconstitute the accounting procedures of utilities use of liberalized depreciation and accelerated amortization."

Management changes . . . United Illuminating Co ups L. A. Dunn to vp in charge of Bridgeport operations . . . Westinghouse elects Mark Cresap, Jr, president and chief executive officer . . . D. W. Jones is new vp at Duke Power, Carl Horn, Jr is new general counsel.

WEEKLY POWER OUTPUT—UP 11.4% (Week ending April 4), Kwhr 12,618,000,000



Per Cent Change From Previous Year

	Mar. 21	Mar. 28	April 4
Total U. S.	+ 9.7	+ 9.1	+11.4
New Eng.	+ 6.5	+ 7.0	+10.3
Mid. Atlantic	+ 3.2	+ 7.2	+ 9.7
Cent. Ind.	+13.0	+12.2	+16.1
West Cent.	+ 8.6	+ 9.7	+ 9.7
Southeast	+ 4.2	+ 2.0	+ 5.9
South Cent.	+13.1	+13.4	+14.0
Rocky Mount.	+12.4	+15.4	+14.5
Pacific			
NW	+ 8.1	+ 9.8	+ 8.0
SW	+16.9	+17.9	+16.8

Seasonally Adjusted Index 249.8

Week Ago 249.6 Year Ago 223.5

Source: Edison Electric Institute

Preview of this Issue

EVENTS ▶ **The Edison Award has been presented to Alabama Power Co** for its full-scale development program on the Coosa and Warrior rivers **(p 66)** . . . Pennsylvania Electric Co, in announcing experimental EHV project, says 460-kv appears to be next logical transmission voltage **(p 67)** . . . Recent court decisions state that a legally doubtful contract with a co-op can be canceled, and that a customer's preference is the criteria for extensions in areas served by two utilities **(p 68)** . . . Reports on reactor design studies submitted to AEC indicate feasibility now of 8 to 9-mill power **(p 70)** . . . New York PSC has ordered use of actual taxes for rate making and accounting, if liberalized depreciation is employed **(p 71)**.

SELLING ▶ **Connecticut L&P boosts street lighting revenues by 65%.** The big New England utility expects to hit the $2-million-a-year mark by 1960. The sales secret behind this week's cover story is told on **page 72.**

ENGINEERING ▶ **The sheer size of today's large turbines makes balancing difficult.** In a unit with a rotating weight of 100 tons, an unbalance of only two to four oz in a critical place may cause vibration. This and other causes of vibration are examined by GE's J. R. Lindsey, beginning on **page 78** . . . Bureau of Reclamation stages fault tests to probe poor light-

Politics and Public Power

RUMBLINGS IN THE FAR WEST

Keep a close eye on hearings that cranked up again in Washington last week. The issue: How an interconnection of western power lines can give federal power a leg up.

Federal power advocates are trying to drive Congress to build a federal power interconnection between the Bonneville Power Administration and federal facilities in California. It's an old dream, but it could have several effects:

- It could kill, or seriously impair, present negotiations between BPA and Pacific Gas & Electric Co for a new private transmission line interconnecting the two systems (EW, Feb. 2, 1959, p 35).
- If built, a federal tie would be one more line in a nation-wide giant power grid—something federal power supporters are again trying to build.
- Hearings by the Senate Interior Subcommittee on Irrigation and Reclamation could be used as evidence of the need for a BPA-Missouri Basin connection, or for a nation-wide study of federal and inter-regional power lines. Sen James Murray (D-Mont.), chairman of the Senate Interior Committee, has called for such a study (EW, Feb. 16, 1959, p 65).

A Bonneville-California power interconnection first was recommended by the Defense Power Administration during the Korean conflict. At that time, the Federal Power Commission pointed out that the cost benefit-to-cost ratio would be more favorable if the line were federally built. Nothing came of these recommendations.

Originally, the tie was intended primarily to put more power into the Pacific Northwest. Now, however, the situation has changed. BPA, faced with an operating deficit, came

ning, relaying and reclosing performance on 230-kv line. Details by Bureau's J. O. Grimm on **page 76** . . . Idaho Power, using 34.5 kv for primary distribution, saves at least $11.79 per installed distribution transformer kva over an otherwise similar 12.5-kv area **(p 74).**

MANUFACTURERS ▶ **Anaconda Wire & Cable opens extra high voltage laboratory** for research, development and testing of conductor cable up to 345 kv . . . Westinghouse Pres Mark Cresap sees moderate gain in new orders in 1959 . . . GE going into the instrument rental business **(p 92).**

NEW EQUIPMENT ▶ **Pole setter designed to handle 100-ft Class A poles** . . . Emergency generator may be used during changeover of lines and substations . . . Aerial cable clamp provides messenger diameter from 5/16 to 5/8 in. . . . Digger digs holes up to 10½ ft deep, 9 to 30 in. dia **(p 100).**

MANAGEMENT ▶ **How much do utility engineers earn?** Engineers Joint Council has the most complete answer yet, after a survey of the salaries of 200,000 engineers in all walks of professional activity **(p 113)** . . . Allen Van Wyck, president of Illinois Power Co, calls for more reactor research, less crash construction of full-scale nuclear power plants. For a clear statement of the A-power issue, see **p 114.**

to PG&E in late 1958 with an offer to sell dump power into the company's California markets. These sales would also help prevent a general rate hike for BPA's customers.

PG&E, with California-Oregon Power Co, has tentatively agreed to build a 90-mile, 230-kv line to interconnect with BPA. This would allow BPA to sell up to 200,000 kw of surplus power to PG&E, and would also provide for PG&E firming up of 150,000 kw of BPA power.

Not good enough, say the federal power boys. Indeed, they claim, the line ought to be at least 345 kv (maybe even 460 kv) with a capacity of one million kw, running from Dalles and John Day dams into the federal Central Valley Project in California. And it ought to be a federal common carrier line, not a "monopoly line," claims Gus Norwood of Northwest Public Power Assn. Norwood cited a December, 1958 study by H. Zinder & Associates, which claims that the benefit-to-cost ratio of a federally built line would be five to one. Congress would have to approve funds for the line.

Sen Clair Engle (D-Calif.) has called on Interior Secy Fred Seaton to delay negotiations between BPA and PG&E until the committee can review them. "Let's not concede the ball game before the other side has a chance to bat," Engle commented, adding, "The opposing line-up (federal power advocates) has some real sluggers who will give a good accounting of themselves, if the umpires don't upset the rules."

But it isn't likely the umpires will upset the rules. What is important is the batting tries of the "other side"—or the unknown slugging power of, say, Gov Edmund Brown of California.

Aluminum conduit is challenging the major role played by steel in the conduit field. Aluminum will go after the larger sizes of electrical conduit where weight savings and corrosion resistance are factors. **The Iron Age, March 12, 1959.**

TECHNICAL NOTES

Meter testing costs may be reduced appreciably in the future, possibly by 1965, as the proportion of Classes IV and V, and more accurate newer types of meters, grows among total meters in service. More importantly, the cost of testing will not increase greatly as more domestic meters are added. **Larry Dwon and J. A. Morris, American Electric Power Service Corp, AIEE TP 59-167.**

Tests of ceramic fuel elements indicate higher temperatures and hence higher efficiencies for nuclear reactor operation. Uranium dioxide ceramics, formed under 50,000-psi pressure, sintered, and machined with diamond-faced tools, will withstand up to 5,000 F, over three times the limit of present fuel elements. **General Electric Co, Hanford, Wash.**

Fuel cells with high output and long life for direct generation of electric power from fossil fuels can be devised for 70% thermal efficiency. Such cells located close to a coal mine could show a lower fuel cost than a nuclear plant for the indefinite future. **Everett Gorin and Howard L. Recht Consolidation Coal Co, Mechanical Engineering, March, 1959.**

Rubber-tired running gear is substituted for steel-wheel under-carriages, allowing a 110-ton capacity, truss-type rail car for large power transformers to leave the rails and move over highways. The change from rail to road transport, or vice versa, may be made in about two hours at any level grade crossing. **Bulletin Oerlikon 330, Oerlikon Engineering Co, Zurich, Switzerland.**

White noise interference is produced in a signal generator that develops random electrical signals with uniform power per unit of bandwidth. The device, a laboratory standard, measures the noise factor to determine the sensitivity of radio receivers to such white noise sources as fluorescent tubes, bearings, and leather belts. **Frontier, Winter, 1959, Armour Foundation.**

You gain extra clearance two ways

It's quite possible that the extra 12 inches of pole-top clearance you get from using Varex capacitors could mean the difference between using the existing pole and paying for either a pole extension or a completely new pole.

Then there's the saving in installation time. To get the clearance for moving capacitors under the primary and into the rack it's often necessary to move the primary with hot sticks. By using Varex units you may avoid this problem.

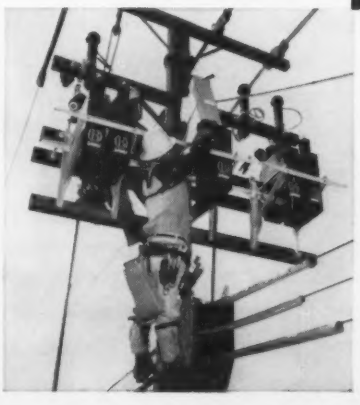
You get extra clearance from the Varex design in two ways. Varex 50-KVAR units are as much as five inches lower than other brands. Another six to eight inches of clearance is gained by the central location of the lifting eye between the bushings. Your hook, shackle, or clevis can go right down between the bushings without any space-consuming sling arrangement.

This is just one example of the way Varex designers have kept you, the user of capacitors, foremost in mind. It's another good reason for making sure Varex capacitors are on your standards list.

OHIO BRASS COMPANY, MANSFIELD, OHIO

Low height, central lifting eye make VAREX capacitors easy to install at pole top

Hook goes down between bushings; no sling arrangement needed.



Low over-all Varex height provides extra clearance at poletop.

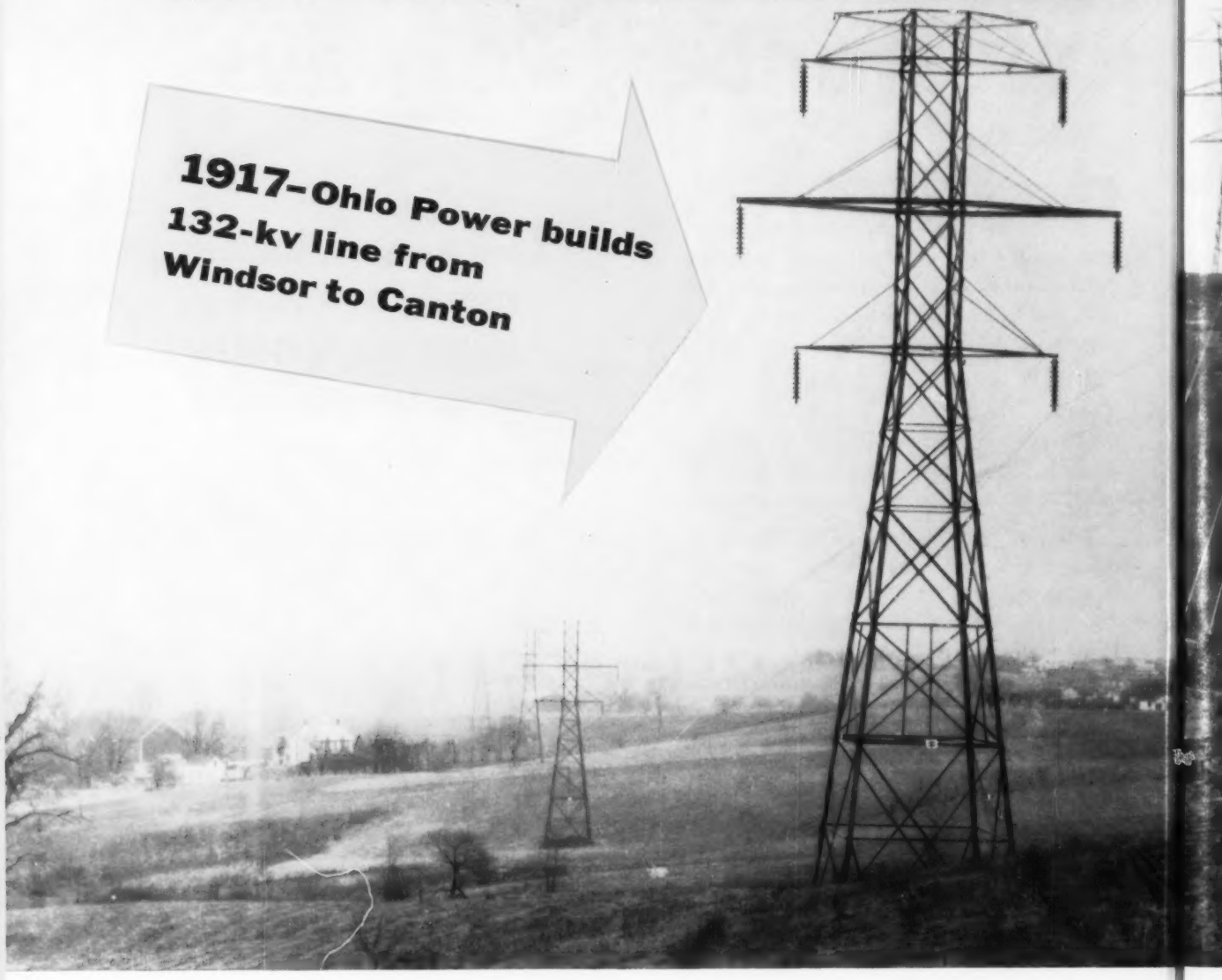
Ohio Brass

HOLAN

PORCELAIN INSULATORS · LINE HARDWARE · CAPACITORS · LIGHTNING ARRESTERS
BUSHINGS · HOLAN TRUCK-MOUNTED POWER DEVICES AND BODIES · BRONZE VALVES

When Ohio Power makes EHV

1917–Ohio Power builds 132-kv line from Windsor to Canton



GOLDEN ANNIVERSARY
1909 1959
MODERN SUSPENSION INSULATOR

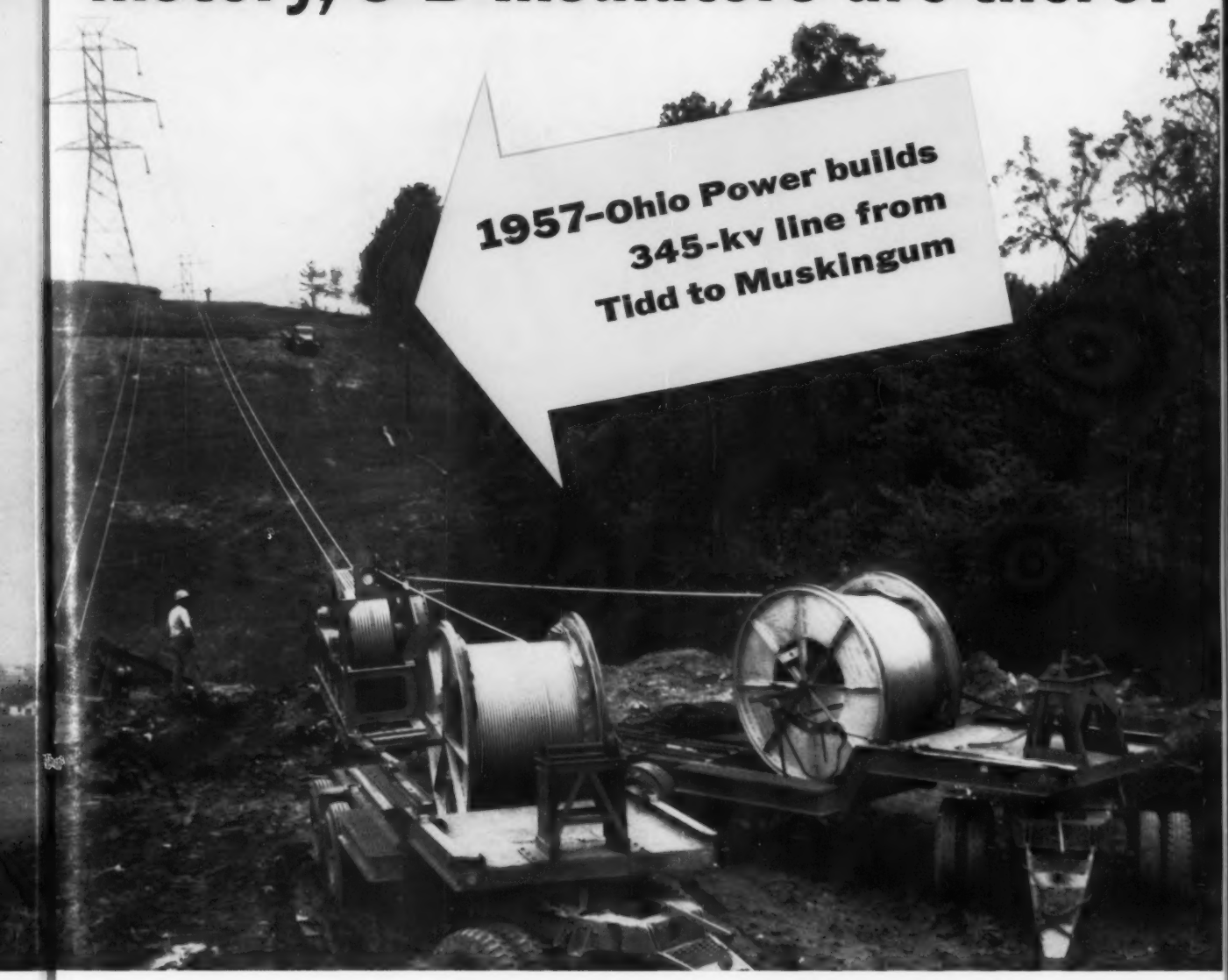
First major step in the integration of the American Electric Power System (then American Gas and Electric) occurred in 1917, in the territory of what is now the Ohio Power Company.

The modern 30,000-kw Windsor steam plant had just been built on the Ohio River near Wheeling. The plant was 55 miles from its load center at Canton, Ohio. Here was the foundation for an integrated system, with generation located for maximum efficiency, tied together by high-voltage transmission lines.

132-kv transmission was an extra-high voltage in its day. Success of the Windsor-Canton line quickly led to more 132-kv transmission in both Ohio Power and sister AEP companies. By 1929, the 132-kv network permitted two-way power exchange throughout the area from Lake Michigan to the border of North Carolina.

Now American Electric Power has 1,200 miles of 345-kv transmission line, today's

history, O-B Insulators are there!



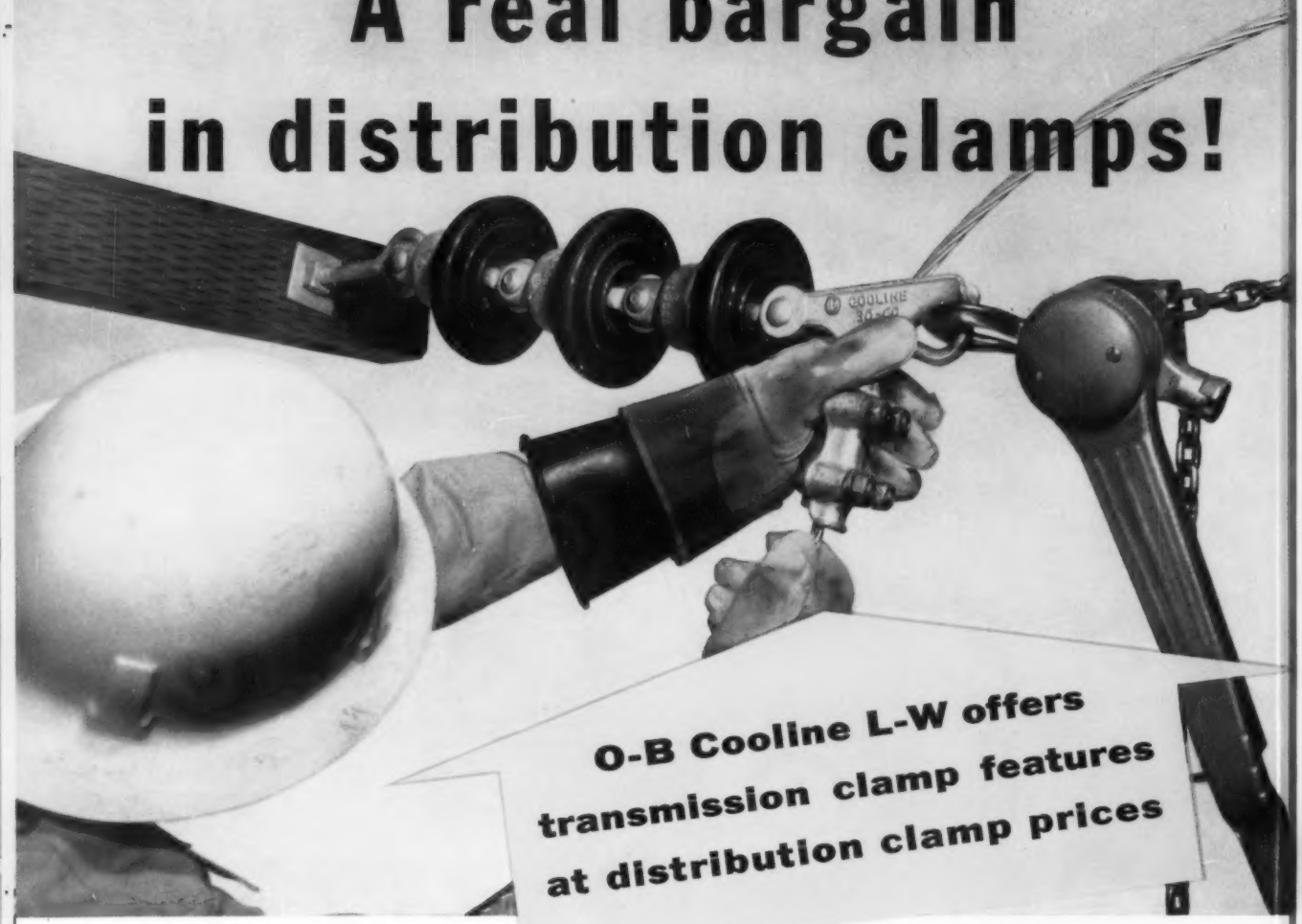
EHV. The latest 345-kv addition to the Ohio Power system is the 84-mile line linking the Tidd plant on the Ohio River with the Muskingum plant on the Muskingum River. More than 16 miles of the 84-mile line have bundled conductors strung under tension.

O-B insulators were used on the Windsor-Canton line. They are in service on the new Tidd-Muskingum line. When EHV history is being made, O-B insulators have a habit of being there!

Ohio Brass (B) **HOLAN**

PORCELAIN INSULATORS · LINE HARDWARE · CAPACITORS · LIGHTNING ARRESTERS
BUSHINGS · HOLAN TRUCK MOUNTED POWER DEVICES AND BODIES · BRONZE VALVES

A real bargain in distribution clamps!



You can build transmission-grade construction into distribution deadends when you use the low-cost, aluminum Cooline L-W clamp.

The O-B Cooline L-W is especially designed for the distribution trend to larger conductors and shorter spans, but it offers many of the advantages of the heavy-duty Cooline series for transmission lines. The L-W has:

Excellent Holding Strength -- More than adequate for distribution deadends -- 10,000 pounds for two U-bolt clamps, 15,000 pounds for three U-bolt model.

Aluminum Construction -- Minimizes electric losses and conductor heating.

No Need to Cut Conductor -- Conductor can be strung in continuous loop without cutting or splicing. It automatically comes off at the proper angle for making the jumper loop.

Protection for Conductor -- Wavy seat of clamp and special contour of captive keepers develop firm holding action without crushing conductor.

Wide range of conductor sizes (.20 to 1.3 inches diameter), light weight, standard packaging for easy handling and inventory, and simple installation are among the many benefits of this versatile clamp.

You get all this in the Cooline L-W at a price that will surprise you -- pleasantly. Check the L-W and you'll find it's today's real bargain in distribution deadend clamps.

LIVE BETTER ELECTRICALLY

This product distributed by GraybaR ELECTRIC COMPANY

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass B HOLAN

PORCELAIN INSULATORS · LINE HARDWARE · CAPACITORS · LIGHTNING ARRESTERS
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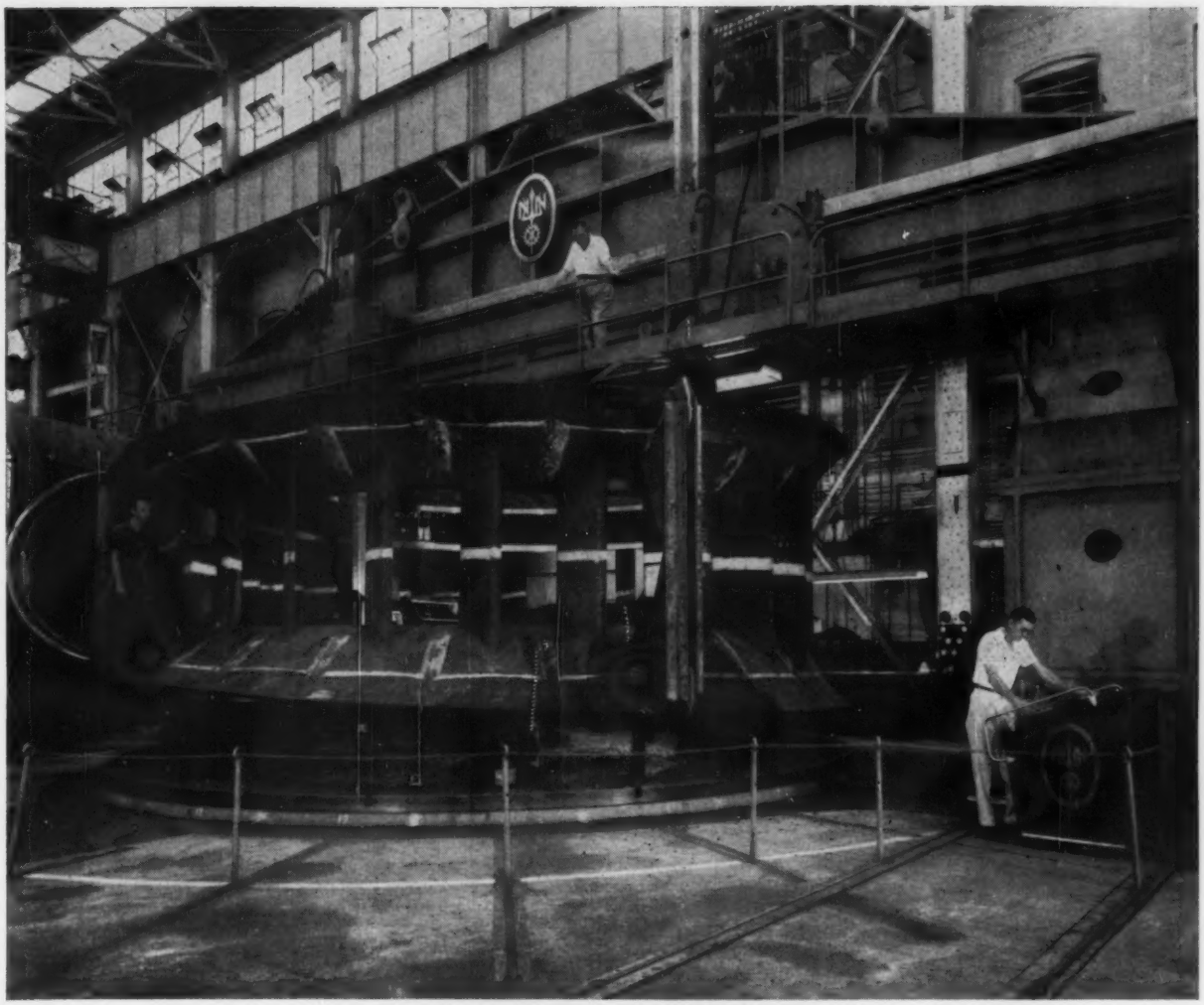


42 ft. boring mill-rough cuts a stay ring for one of the world's most powerful hydraulic turbines.

Newport News builds six king-size turbines for Niagara Power Project

These skilled Newport News machinists are milling a stay ring for one of six 200,000 hp. Francis-type hydraulic turbines. Before they're finished, they'll turn out five more turbines—the world's most powerful—for the Lewiston Power Plant of the Niagara Project.

Newport News has not only the men, but the facilities to take a job like this in its stride . . . your job, too. For example, the 42 ft. boring mill pictured above was designed and built at Newport News.

The large engineering and technical staffs, acres of iron, brass and steel foundries, five huge machine shops, and additional specialized equipment make Newport News a leader in the production of hydraulic turbines, valves, gates, penstocks, and other water power equipment you need.

Consult Newport News engineers on preliminary design recommendations at no obligation.

Engineers . . . Desirable positions available at Newport News for Designers and Engineers in many categories. Address inquiries to Employment Manager.

Newport News
Shipbuilding and Dry Dock Company
Newport News, Virginia

DEVELOPED TO MEET YOUR NEEDS:

A COMPLETE LINE OF

for all your installation

CLASS 200 | **CLASS 100** | **CLASS 10**

Sangamo Type P Meters offer unusual economies with accurate measurement.

Available now for all polyphase loads. The meters start at 18 watts—operate continuously at 96,000 watts.

You can calibrate in half the time. There are up to four fewer adjustment points. In addition to micrometer power factor adjustment, the P2 Meter has only three adjustments—full load, light load, and balance.

You save money in glass covers. These meters are the only polyphase meters small enough to use your standard metal base singlephase meter covers.

You have greater surge protection. Current windings are encapsulated in high strength epoxy resin insulation. Both current and potential coils have breakdown in excess of a 15 KV surge.

You gain economy through slow speed. Reduced series damping and fewer revolutions just naturally mean greater accuracy and better performance.

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

JM59-4

LIFETIME GUARANTEED SANGAMO TYPE P METERS FOR

Class 200 4 wire, 2 stator Delta

Class 200 4 wire, 2 stator Wye

Class 100 2 stator Network meter

POLYPHASE METERS

requirements...

ALL POLYPHASE MEASUREMENT

Class 100 3 wire, 3 phase, 480 v.

Class 10 4 wire, 2 stator Delta

The potential coil can be removed and replaced without disassembling other components. *Replacement time is cut in half.*

60TH ANNIVERSARY SANGAMO 1899 - 1959

ANACONDA

THERE IS A DIFFERENCE IN ACSR

...and that difference is cable experience!

There is a priceless ingredient in Anaconda ACSR – *cable experience!* More than 50 years' work with transmission cable of all types. Designing, testing, manufacturing. Field consultations on hundreds of complex jobs.

You'll find Anaconda's cable experience shows up in many ways: longer trouble-free performance by the cable itself, practical suggestions by Anaconda's field engineers that may save you time and money.

So–before you start your next job–it will pay you to talk to the Man from Anaconda.

Backed by the broadest line of wire and cable in the industry, in both copper and aluminum, he is qualified to help you arrive at the most practical and economical answer to your cable needs.

Multi-mill manufacturing facilities – strategically located across the country – assure speedy service. Write or call today! Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York. 8071

Pictured at left: high-voltage transmission line of Anaconda ACSR being strung in the Northwest.

ASK THE MAN FROM

ANACONDA®

FOR

ALUMINUM WIRE AND CABLE

Get the most out of transformer rebuilding

Specify

WAGNER FORM W

Replacement Assemblies

for full NEMA Standard Cores and Coils with *new low impedance and lower core losses*

Whether you rebuild your own transformers or send your rebuilds out—it will pay you to specify Wagner Form W Replacement Core and Coil Assemblies. With Wagner, you get full NEMA Standard elements, exactly like those used in new Wagner Transformers.

You get the advantages of lower impedance values, better regulation and lower losses. You get the most out of up-rating, too—in sizes up through 15 kva, you can install the largest cores and coils that will fit your tank and still remain within NEMA temperature rise standards.

Wagner Replacement Assemblies come to you ready to install. They have been fully tested and dried, and are packaged in transformer oil for complete protection. Available in ratings from 3 through 167 kva.

WAGNER FIELD REPAIR SERVICE FOR SUBSTATION TRANSFORMERS

Wagner Transformer Service Trucks, manned by expert field repairmen, are available on schedule. The cost of this exclusive Wagner service is nominal. Write for details.

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

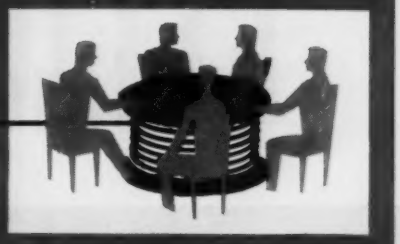
Wagner Electric Corporation

SERVING 2 GREAT GROWTH INDUSTRIES...ELECTRICAL...AUTOMOTIVE

WR593

DU PONT

WIRE AND CABLE ROUND TABLE



New Du Pont study on corona proves ALATHON® polyethylene resin ideal for power-cable insulation

You have asked . . .

Q: What is the effect of voltage stress on polyethylene?

A: When exposed to voltage stress alone, polyethylene can withstand surprisingly large gradients indefinitely. If corona is present, polyethylene – like all other conventional insulations – is gradually degraded. Corona must be minimized or avoided.

Q: Does corona produce a surface effect or an internal one?

A: A surface effect. In case of voids in the body of an insulation, corona appears only on the inside surface of the void.

Q: What are the implications of this study for the manufacturer and user of cables?

A: The importance of freedom from corona is highlighted – this means designing for the absence of either internal voids or space next to strand or shield. It is also important to design for an absolute minimum of residual mechanical strain, which would accentuate the effect of any residual or momentary corona. Improved life in nitrogen as compared with air suggests advantages for nitrogen or other gas pressure-type cables for the higher voltage levels.

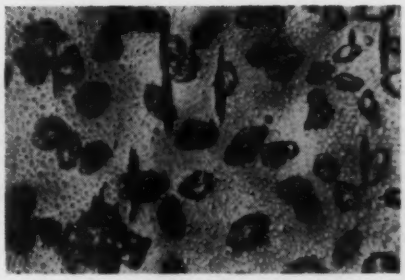
Du Pont does not manufacture wire and cable but supplies thermoplastic resins for insulation and jacketing.

by Joseph R. Perkins

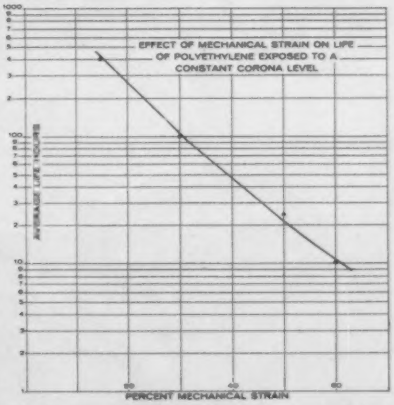
A detailed Du Pont research program on the behavior of polyethylene under high-voltage gradients has provided some interesting answers to two questions: What product information must be supplied to the cable designer to enable him to design the best high-voltage cable? How can Du Pont devise and manufacture the best polyethylene for this use?

Experiments involving more than 400,000 sample exposure hours have demonstrated the ability of polyethylene to withstand high voltage, the effects of corona and mechanical strain, entirely unexpected effects of humidity, behavior under inert gases and the relative importance of many other variables.

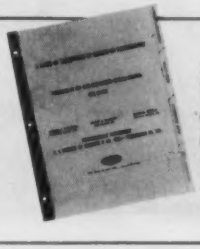
Also revealed was the fact that Du Pont ALATHON 3B polyethylene resin is the best resin among those tested for use as a primary power-cable insulation. It proved superior to all other commercially available resins examined under all conditions tested: air at 50% and 95% RH and inert atmospheres.



Highly magnified view (250x) of a stretched polyethylene surface after exposure to corona. The cracks run at right angles to the direction of stretching; the crystals are oxalic acid.


EFFECT OF MECHANICAL STRAIN ON LIFE OF POLYETHYLENE EXPOSED TO A CONSTANT CORONA LEVEL
AVERAGE LIFE IN HOURS
PERCENT MECHANICAL STRAIN

Effect of mechanical strain on life of polyethylene exposed to a constant corona level.



SEND FOR YOUR FREE COPY of this 28-page illustrated booklet: "A Study of the Effects of Corona on Polyethylene". It will give you full details of all experimental results and the techniques by which they were obtained. Write to: Polychemicals Dept., Room 174, E. I. du Pont de Nemours & Co. (Inc.), Wilmington 98, Delaware.

POLYCHEMICALS DEPARTMENT

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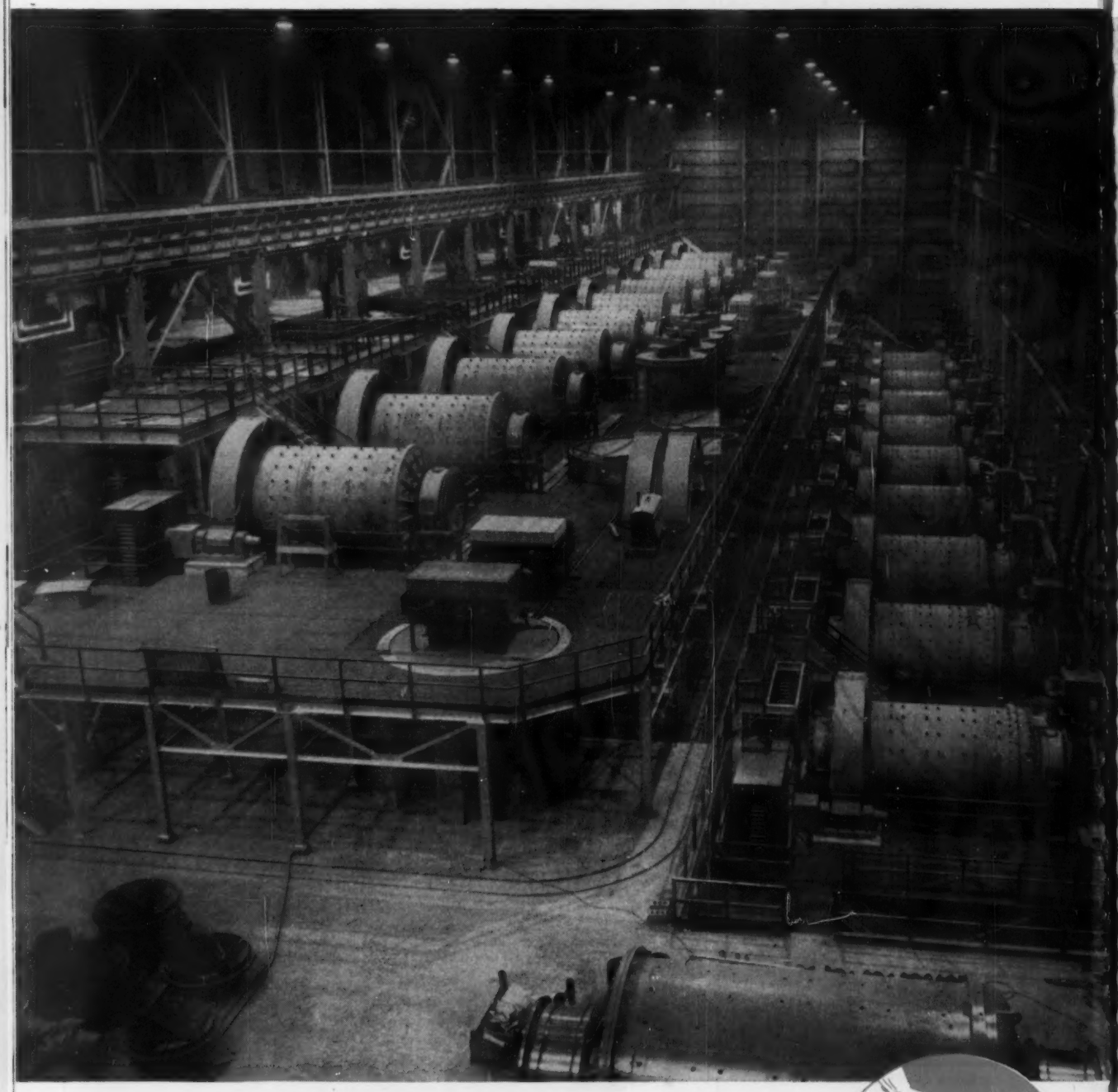
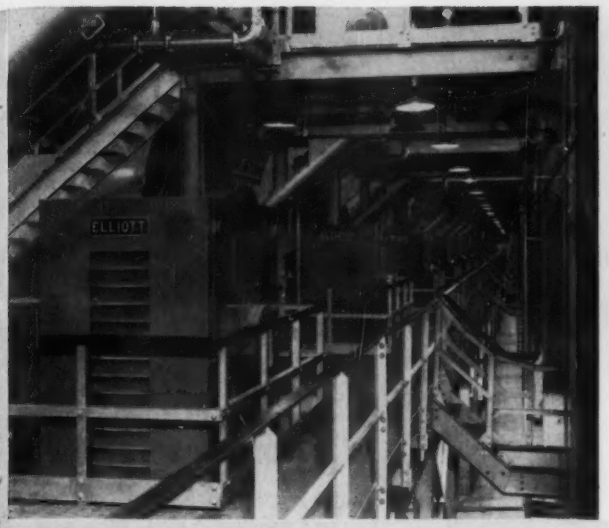


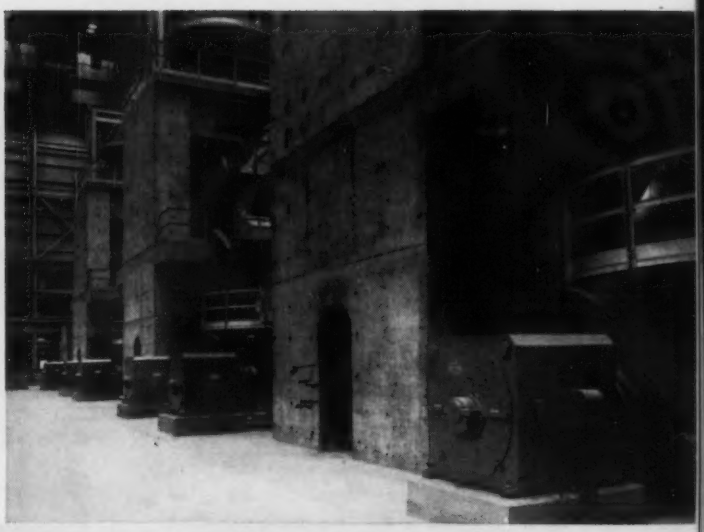
54 ELLIOTT SYNCHRONOUS MOTORS POWER ROD AND BALL MILLS

Above is shown a part of the world's largest ore mill installation, 27 rod mills and 27 ball mills, all powered by Elliott synchronous motors. Large chunks of taconite, one of the hardest minerals known, from the Minnesota Mesabi range are broken down in cone crushers and reduced to flour fineness in the above rod and ball mills. Magnetically separated from rock, the powdered iron is rolled and baked into walnut-sized pellets, and stored for shipment to steel's hungry blast furnaces. The above photo shows part of the quarter-mile-long concentrator building which houses the rod and ball mills. One of the 54 large Elliott synchronous motors can be seen in the foreground of each line of mills.

e gigantic Taconite Operation

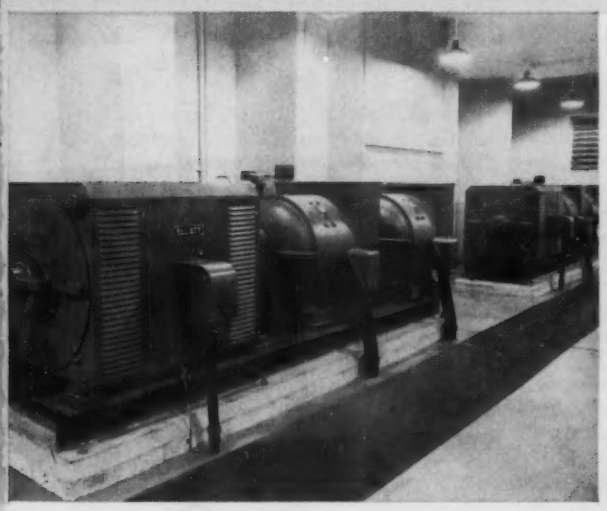


SOME OF THE SYNCHRONOUS MOTORS—The line of 27 Elliott 800-hp, 225-rpm motors which drive the rod mills seen on the left. 27 other Elliott 1250-hp, 225-rpm synchronous motors power the ball mills. Rigid fabricated steel construction and service-proved insulation provide reliable, non-stop power required in this 24-hour-a-day, 365-day-a-year operation.

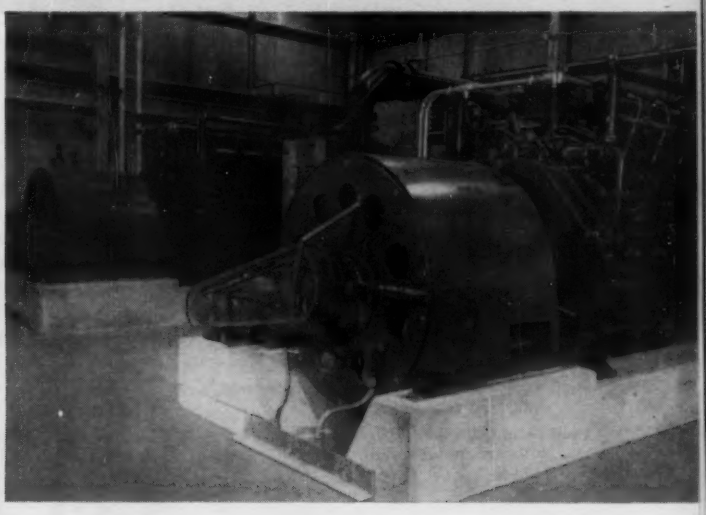


SQUIRREL-CAGE INDUCTION MOTORS—A few of the 18 Elliott 350-hp, 450-rpm squirrel-cage induction motors which drive cone crushers in the secondary crushing plant. FABRI-STEEL construction provides rugged mechanical strength and FABRI-SEAL insulation assures long, trouble-free service life — important features in this 'round the clock, continuous application.

3-UNIT MOTOR-GENERATOR SETS—Two of the 12 Elliott 300-kw, 3-unit m-g sets which provide direct current for driving magnetic separators, drums, crane operation and magnets, field excitation for the synchronous motors, furnace blowers as well as other services. Well balanced, coordinated design assures excellent mechanical and electrical capabilities.



DIESEL-DRIVEN GENERATORS—Two of three Elliott 1130-kw, 900-rpm generators with floor-mounted belted exciters driven by diesel engines—constantly available for emergency power generation. Enclosures are carefully designed to give the optimum in winding protection and insure adequate ventilation for maximum cooling of each diesel-driven machine.



ELLIOTT Company

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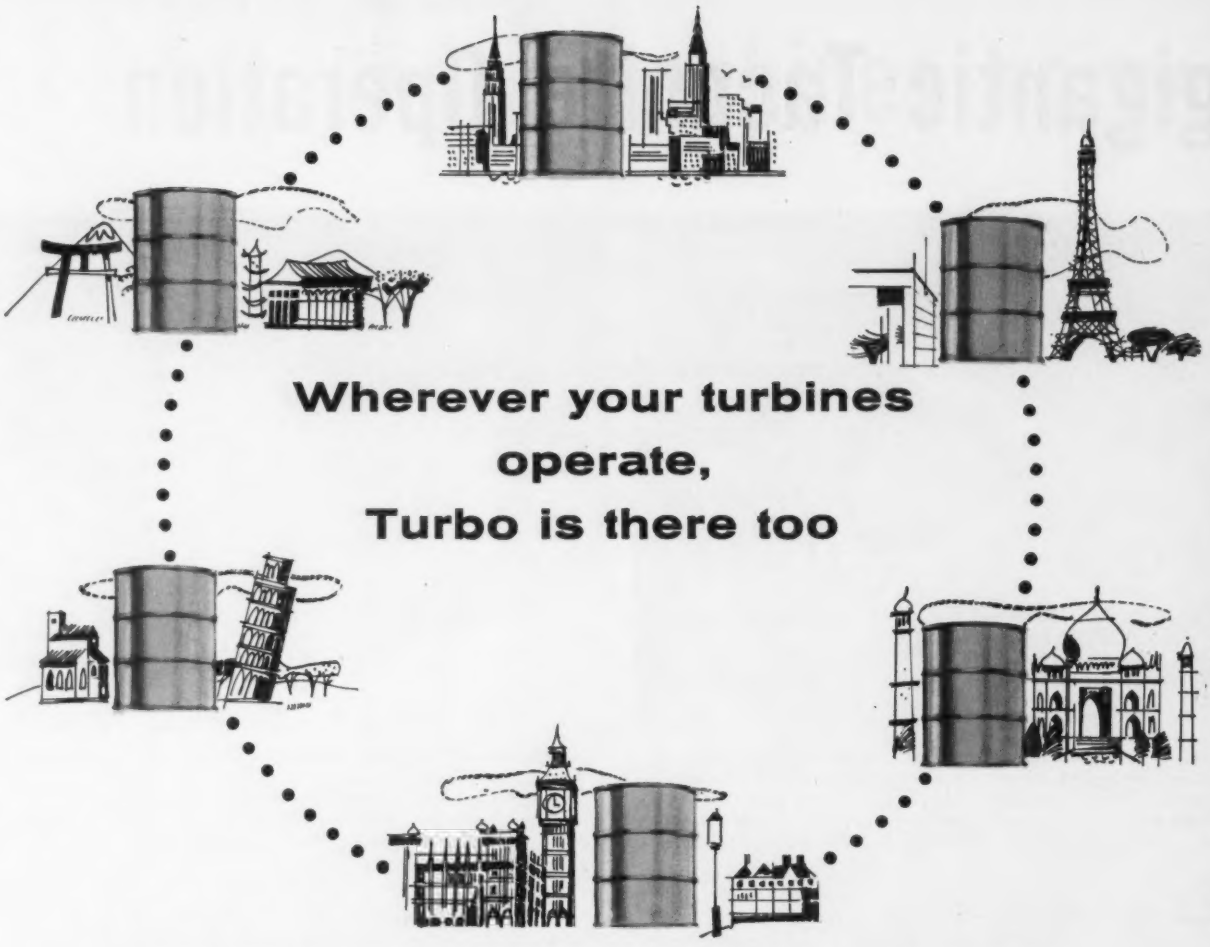
R9-2



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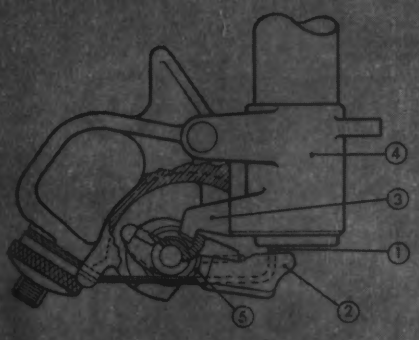

Cutaway view of lower end of the XS Fuse tube showing how fuse link cable (1) holds cable flipper (2) against locking member (3) on ferrule (4). Through this lever system, the fuse link receives only 1/30 of the downward thrust on the fuse tube. Note flipper-actuating torsion spring (5).

S & C's XS Cutout doesn't break the fuse link

It's standard practice for the lineman to slam the fuse tube into the upper contact. There's always a chance that he may be closing in on a fault, so a decisive thrust is required. But when the fuse tube slams into place, the thrust is transferred downward, tending to collapse the toggle and break the fuse link.

S&C's Type XS Cutout has been designed to prevent such link breakage. Instead of using the fuse link itself to restrain the toggle, the XS Cutout uses the cable *flipper* (see illustration, left) to *lock* the toggle in place until the fuse link melts. Yet this locking action in no way impairs the high-speed flip-out of the link cable during circuit interruption. The flipper, powered by a husky torsion spring, insures split-second terminal separation.

The XS Cutout can be used with LOADBUSTER®, S&C's Portable Loadbreak Tool, permitting full load switching with the cutout at no extra cost. For full information, write for Descriptive Bulletin 511, S&C Electric Company, 4421 Ravenswood Ave., Chicago 40, Ill. In Canada: S&C Electric Canada, Ltd., 8 Vansco Road, Toronto 14, Ontario.

Specialists in High-Voltage Circuit Interruption Since 1910

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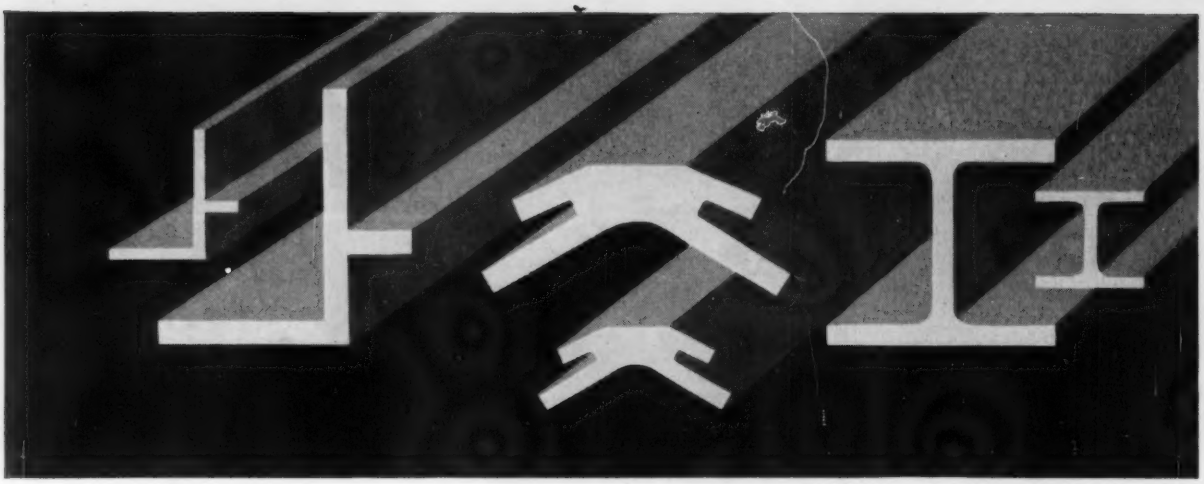


now you can specify

SILVER PLATED

in almost any size or shape

Compare the cost savings of silver plated bus bar over copper

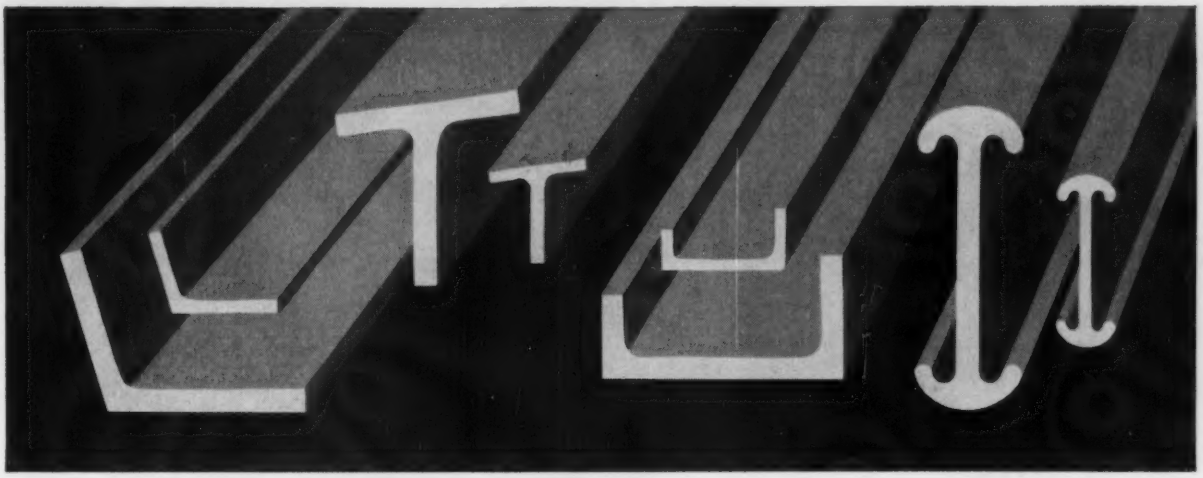
COMPARISON OF RECTANGULAR SILVER PLATED ALUMINUM BUS BARS WITH UNPLATED COPPER BARS

60 Cycle AC Ampacity (1) (Current Carrying Capacity)	Aluminum Alloy 6101-T62 30 C Rise	Copper 30°C Rise	Approx. Cost per Foot Silver Plated Aluminum 6101-T62	Approx. Cost per Foot Unplated Copper (2)
385	⅜″ x 1″		$ .27	
395		¼″ x 1″		$ .56
420	¼″ x 1½″		$ .30	
925	⅜″ x 3″		$ .82	
960	¼″ x 4″		$ .80	
970		¼″ x 3″		$1.64
1350	¼″ x 6″		$1.19	
1405	⅜″ x 5″		$1.37	
1485		¼″ x 5″		$2.29

(1) Ampacity ratings based on standard indoor conditions. (2) Based on Feb. 6, 1959, copper prices

Added strength, size and shape design advantages of Reynolds Aluminum Bus Bar have very little effect on electrical conductivity. For example, a current load of 700 amperes requires a copper bar 2″ x ¼″ weighing just under 2 pounds per foot; Reynolds Aluminum Bus Bar carries the same load with a 2.8″ x¼″ bar weighing only 4/5 pounds per foot. The result is a 60% savings in weight.

Other favorable properties of Reynolds Aluminum Bus Bar, compared with previous bus conductor materials, are an answer to electrical industry demands. Consider a ¼″ x 4″ aluminum bus 6101-T6 with 29,000 psi tensile in relation to a ¼″ x 3″ copper bus with 37,500 psi tensile and equal current capacity. With short circuit strength a direct function of tensile strength, 4 times 29,000 psi for Reynolds Aluminum Bus Bar indicates short circuit strength in excess of copper at 37,500 psi times 3. In addition, the smaller temperature coefficient of resistance for Reynolds Aluminum Bus Bar tends to improve its current carrying capacity; and the skin-effect resistance ratio is much lower than for copper.



BUS BAR (OR PLAIN BUS BAR)

from Reynolds

Here's a double story: design versatility plus silver plated bus bar economy. You can choose from Reynolds wide range of standard extruded bus bar shapes and sizes to meet a specific installation need without specifying oversize conductors because of intermediate size limitations. In addition, Reynolds can extrude special shapes and sizes in practically unlimited range to meet your most exacting requirements. This versatility permits designing to the minimum amount of metal needed for the current carrying job. The result is material costs lower than any other bus conductor.

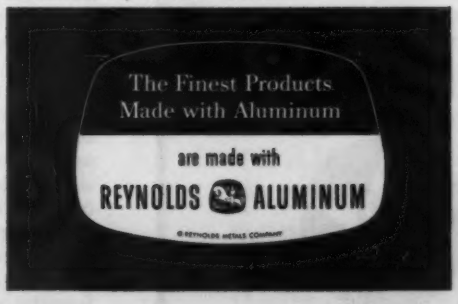
And with Reynolds Silver Plated Bus Bar, you get a surface that permits higher operating temperature with bolted joints; simplified soldering. Silver plated bar also offers savings of 35 to 50% over bare or plated copper conductors. Thus you get optimum strength, high conductivity, simplified installations, design freedom—all at low cost.

Many extruded shapes because of sharp corners and shadow areas are not readily adaptable to a high quality silver plating. Such sections are subject to special inquiry.

REYNOLDS ALUMINUM

Watch Reynolds TV show—"WALT DISNEY PRESENTS"—every week on ABC-TV

For details and availability data, write today for the new brochure, "Reynolds Silver Plated Aluminum Bus Conductors", *Reynolds Metals Company, P. O. Box 2346-EL, Richmond 18, Virginia.* For assistance from Reynolds Engineering Service call your nearest Reynolds office or write to the above address.



Product innovations and experimental programs...

POLE STAR'S

continuous contribution to distribution transformer progress

Production-line impulse testing detects even single-turn faults

One of the first manufacturers to begin production-line impulse testing of distribution transformers (in 1956), Pennsylvania Transformer does so with no protective strings attached: that is, Pole Stars are tested *without* arresters. The apparatus used is so sensitive it will detect even single-turn faults. Result: a high-quality transformer is made even better, and purchasers are assured of the greatest possible uniformity of performance.

Perfect Seal Pole Stars are shipped in special corrugated cartons

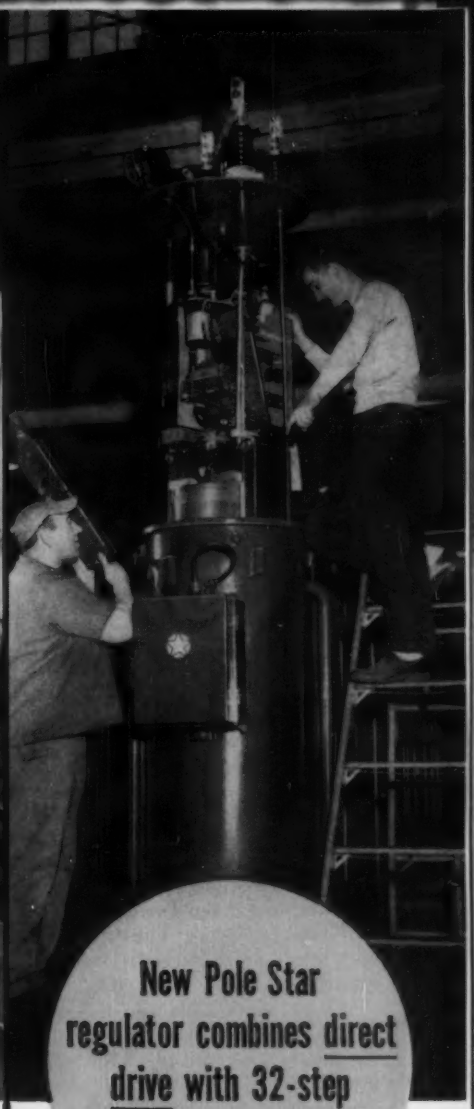
A double test has been taking place with the shipment of hundreds of Perfect Seal Pole Stars to utilities throughout the country. The completely sealed units—destined for "in service" observation and testing—are being shipped in specially designed corrugated cartons. Advantages of the impact-tested, weatherproof containers—such as better protection, easier disposal and lighter weight—are being carefully checked against customers' experiences and comments.

Pioneer of "higher kva" pole-mounting introduces new 250-kva featherweight

In 1953, Pennsylvania pioneered the pole-mounting of transformers above 100 kva by introducing the Featherweight Pole Star 167-kva unit—an innovation so emulated that industry standards soon were changed to include pole-mounting of 167-kva units. Now, Pennsylvania announces the extension of pole-mounting provisions to 250-kva Pole Stars up to 15 kv. This new Featherweight Pole Star offers the same ease-of-handling features as its 167-kva forerunner.

Experiments with aluminum typify never-ending search for new, better materials

Never content with past accomplishments, Pole Star engineers are constantly searching for even more effective methods, designs and materials. Considerable experimentation has been done, for instance, with aluminum—as a conductor in both oil-immersed and dry-type coils, and as a material for tank covers. Whether measured in terms of later applications or of additional knowledge, the results of such experiments help to assure continued product improvement.

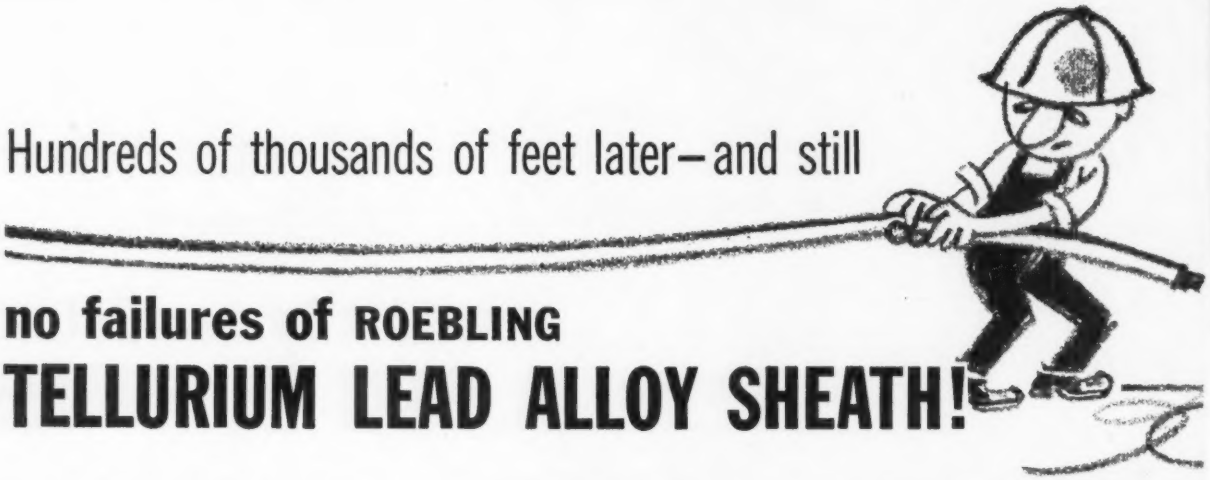


New Pole Star regulator combines direct drive with 32-step regulation

The recently introduced Pole Star Regulator is the only 32-step distribution size regulator that offers a direct-drive tap changer. Based on Pennsylvania's service-proved power-transformer load tap changers, the mechanism features an index-plate method of positioning contacts that assures optimum switching speed, with consequent minimum arcing and extra long life.

PENNSYLVANIA TRANSFORMER DIVISION
McGRAW-EDISON CO.
McGRAW-EDISON
CANONSBURG, PENNSYLVANIA
GREATER PITTSBURGH DISTRICT

Hundreds of thousands of feet later—and still



no failures of ROEBLING TELLURIUM LEAD ALLOY SHEATH!

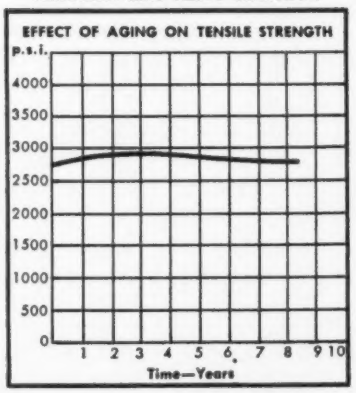
More proof: Tensile strength and elongation remain virtually unchanged, after eight years aging.

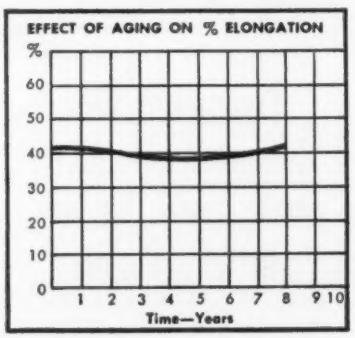
The first Roebling Paper Power Cable with the extraordinary Tellurium Lead Alloy Sheath went into service over five years ago. Since then hundreds of thousands of feet have been put to work. The record? Not a single failure! This remarkable record of service on energized circuits proves conclusively that Roebling Paper Power Cable with Tellurium Lead Alloy Sheath gives you maximum service, with maximum savings!

What's more, we asked the people who bought this cable to put it into the toughest service possible—in such installations as high risers, grades and underground installations where large cable movements and high temperatures prevail. And this gruelling service bears out what we've always maintained: Roebling Tellurium Lead Alloy Sheath has long term stability when it comes to tensile strength and elongation, high resistance to creep and bending fatigue.

These graphs of laboratory tests show effect of aging on tensile properties of Tellurium Lead Alloy Sheath.

TELLURIUM LEAD ALLOY SHEATH...





The exceptional quality of this sheath is one reason why Roebling has more Tellurium Lead Paper Power Cable in service than any other manufacturer. *Another* reason is the superb *inner* quality of this cable. Every step of construction represents scrupulous care. The paper tapes, for instance, are applied under uniformly controlled tension, to assure maximum insulation qualities. And every inch of the cable is tested—then tested again.

You benefit in all kinds of savings—not the least of which is *money*—when you put Roebling Paper Power Cable with Tellurium Lead Alloy Sheath into service! Don't you owe it to yourself, and your company, to find out more? An interesting, profusely illustrated book is yours free. Write for your copy ...right now! Ask for Technical Bulletin 205-C. Electrical Wire Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

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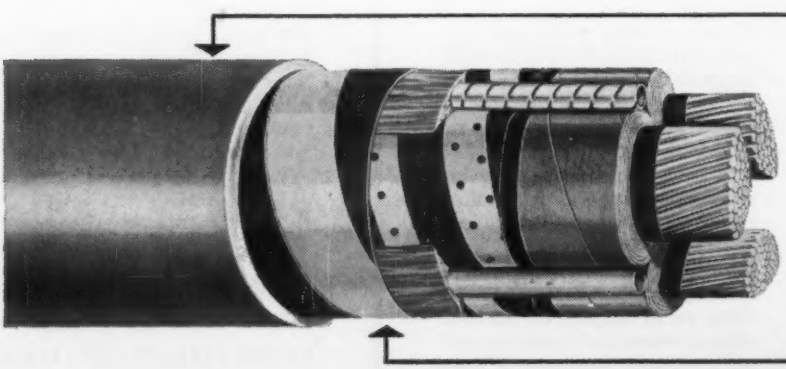


Uniform physical properties are easily achieved in a single operation with the tellurium alloy. This unique feature is but one of several which distinguish the tellurium alloy from other fatigue-resistant lead alloy sheaths.

Mammoth new taping and cabling machines, and the finest obtainable materials, are used to produce the carefully constructed "heart" of Roebling Paper Power Cables.

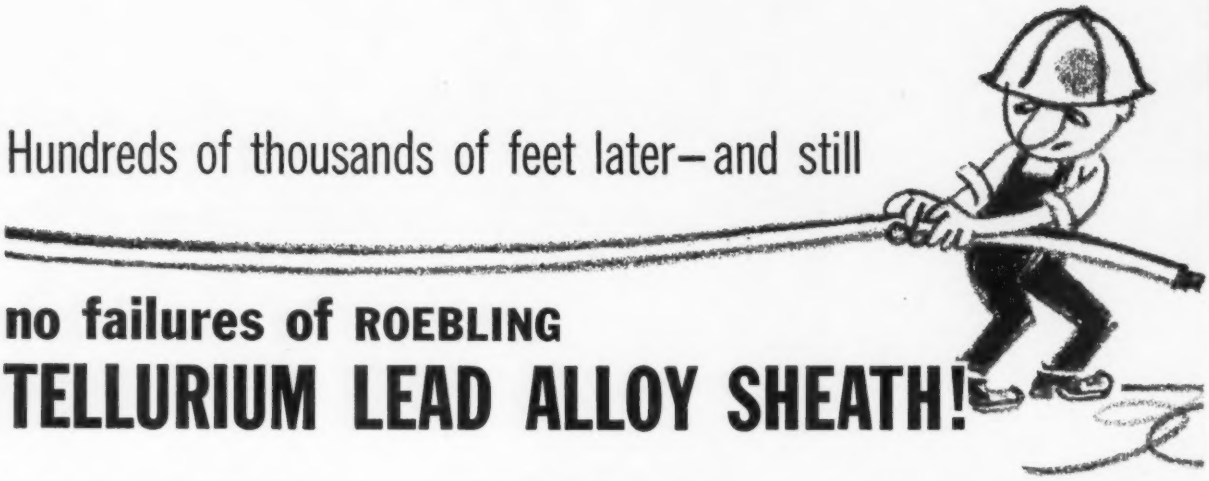
Designed Now– Turbines for the '60's

As another step in its continuing progress to help electric utilities keep electric power America's greatest bargain, General Electric is introducing seven advanced-design, pre-engineered steam turbines specifically designed to meet electric generation requirements in the '60's.

The engineering features incorporated in these units—for top reliability, high performance and maximum simplicity—are the result of over 50 years of intensive research and development coupled with bold planning, engineering enterprise and close cooperation with electric utility companies and consulting engineers.

GENERAL ELECTRIC

Hundreds of thousands of feet later—and still



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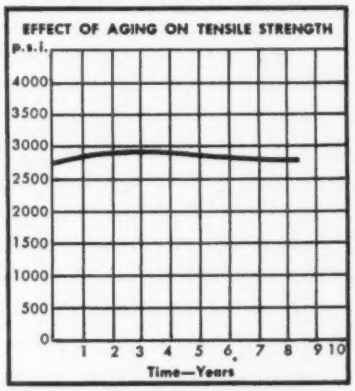

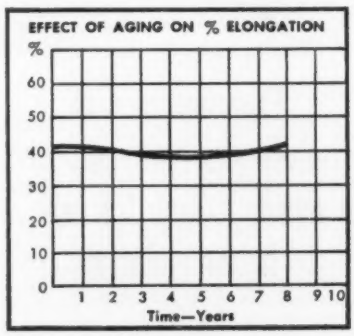

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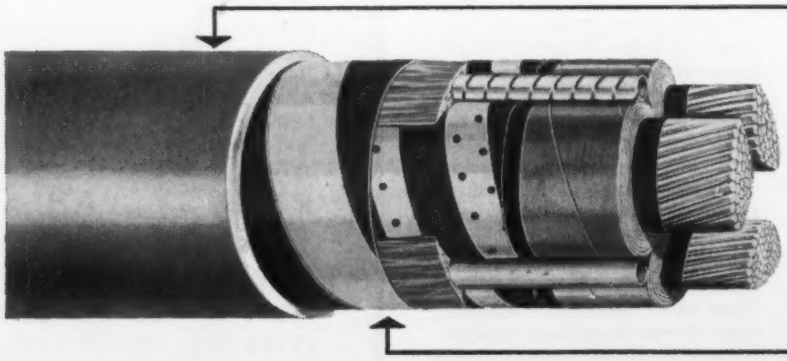

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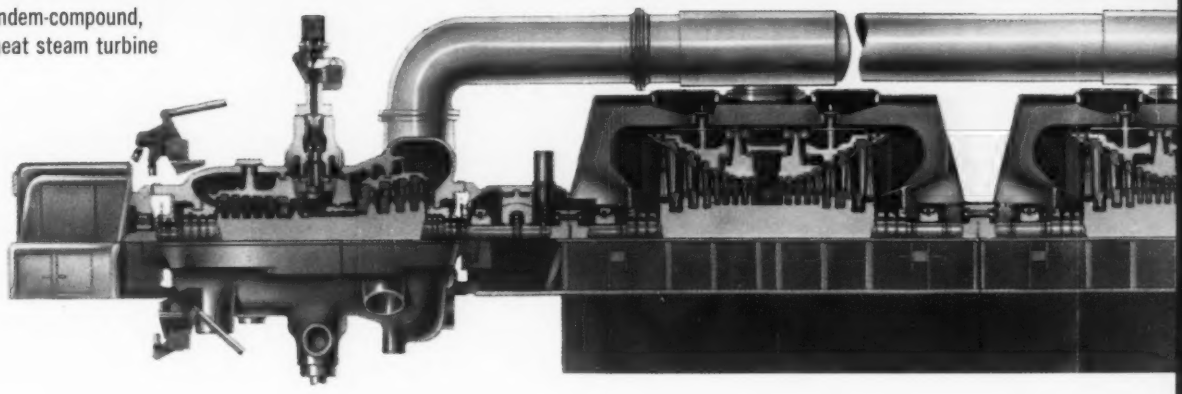
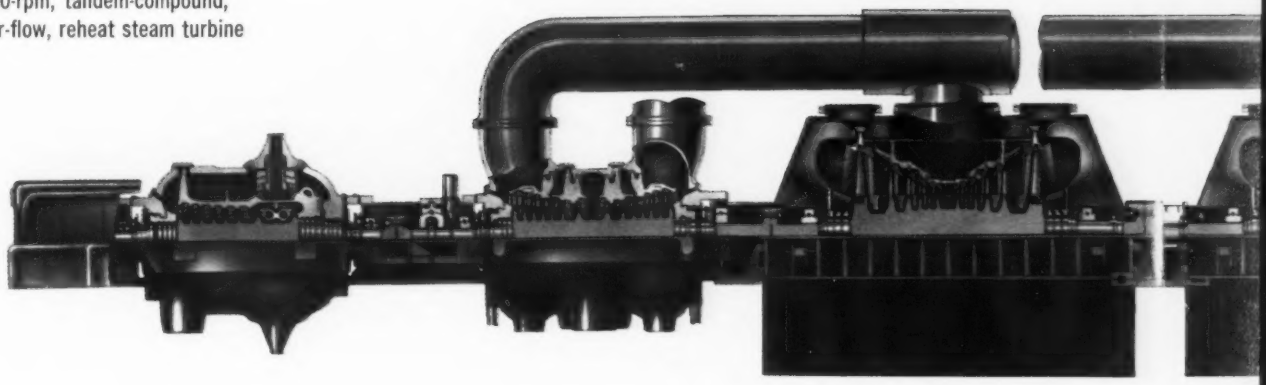
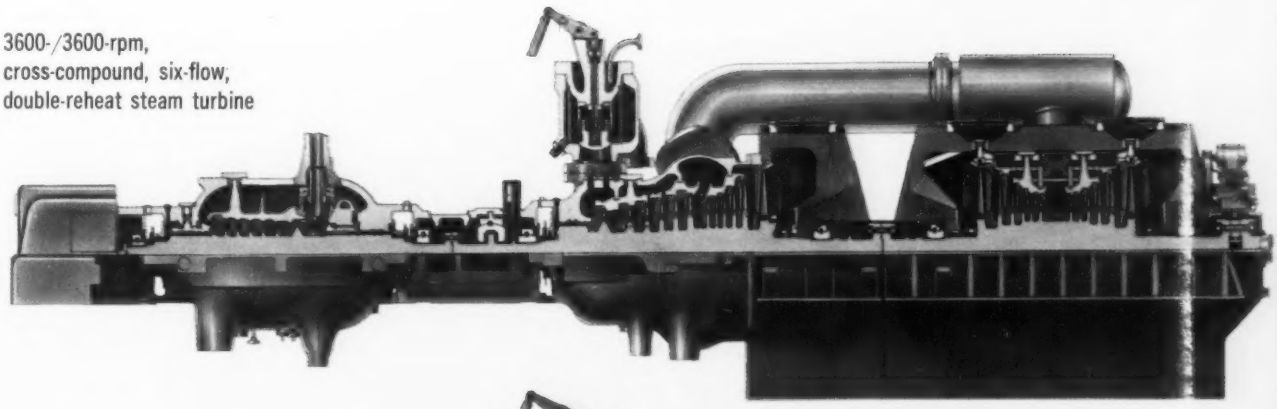
3600-rpm, tandem-compound,
four-flow, reheat steam turbine

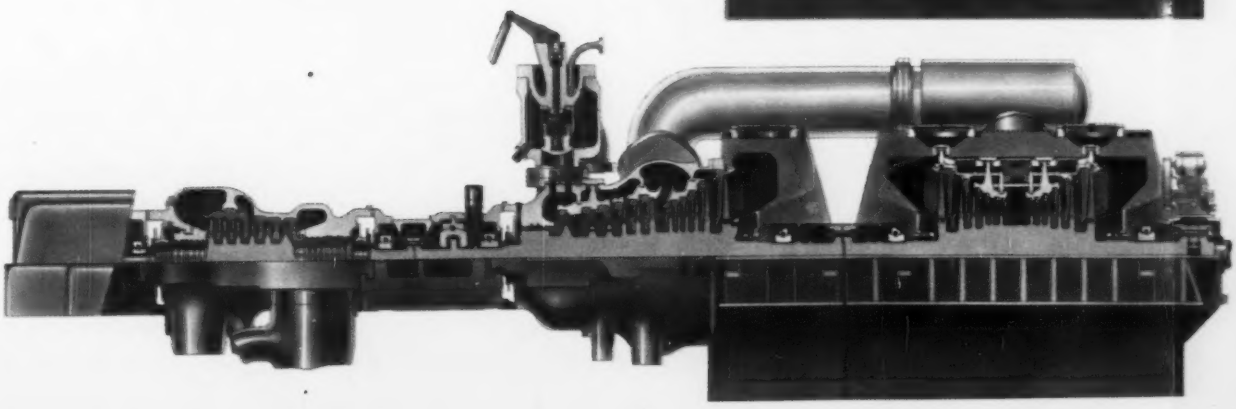


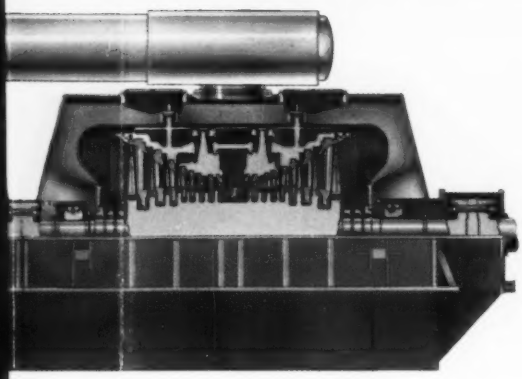
3600-rpm, tandem-compound,
four-flow, reheat steam turbine



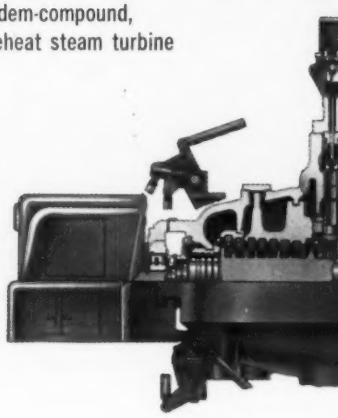
3600-/3600-rpm,
cross-compound, six-flow,
double-reheat steam turbine

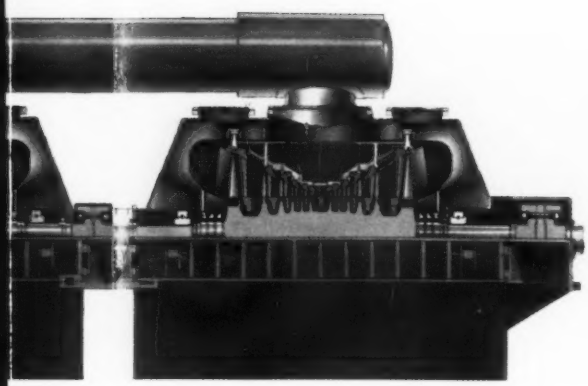




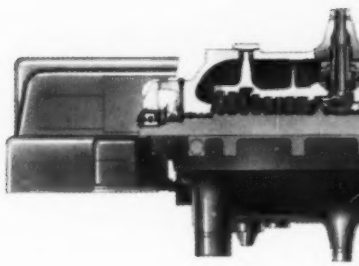


3600-rpm, tandem-compound,
double-flow, reheat steam turbine

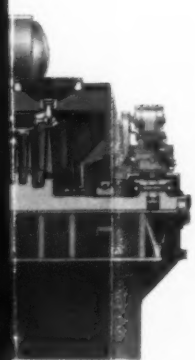


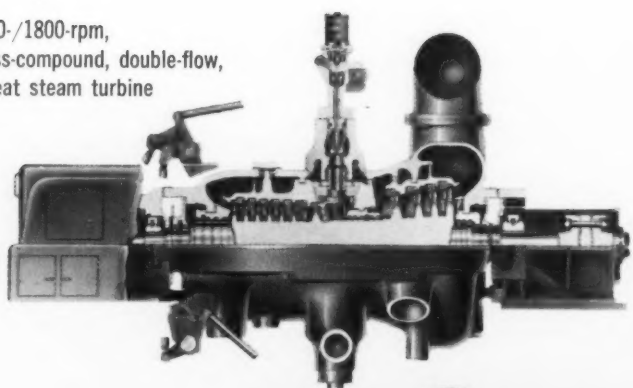


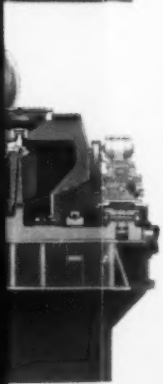
3600-rpm, tandem-compound,
triple-flow, reheat steam turbine

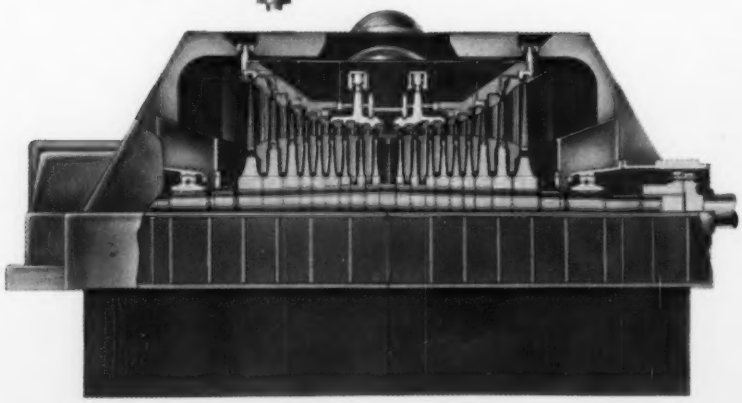


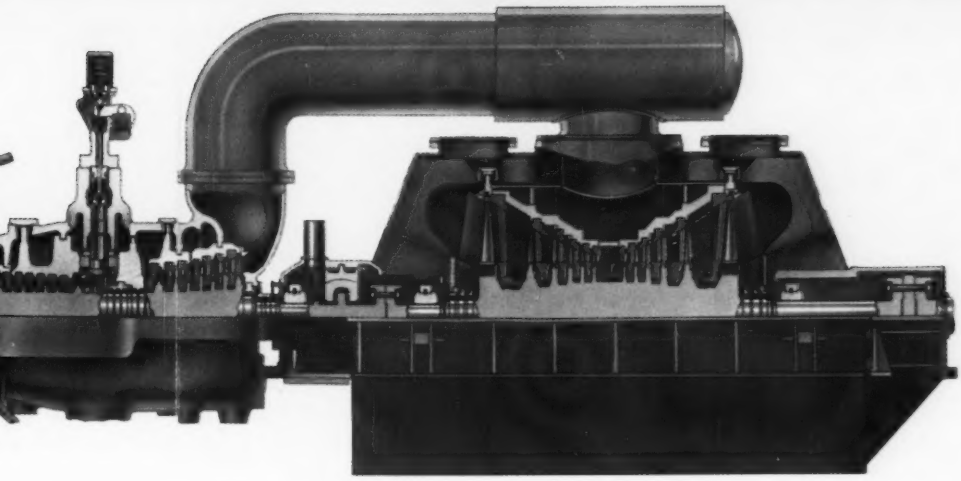
3600-/1800-rpm,
cross-compound, double-flow,
reheat steam turbine

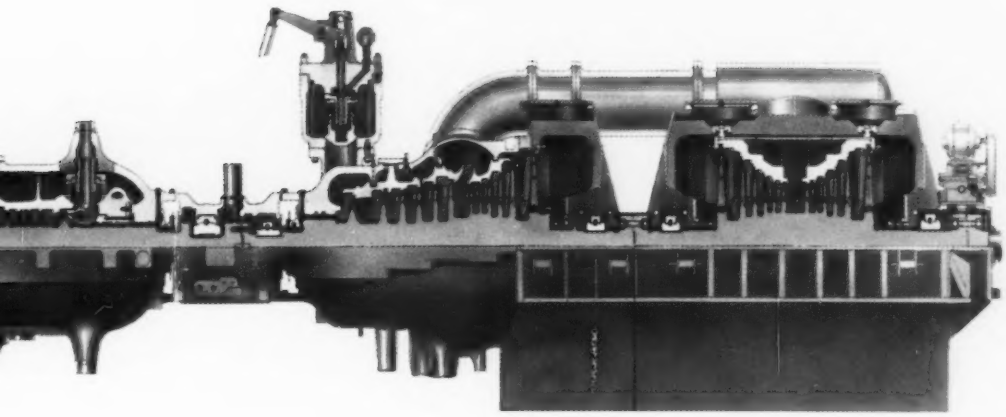




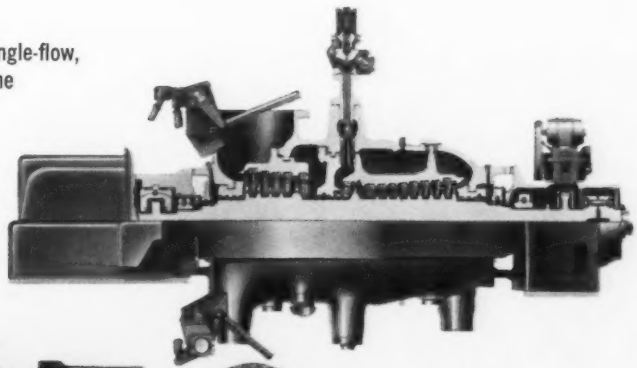


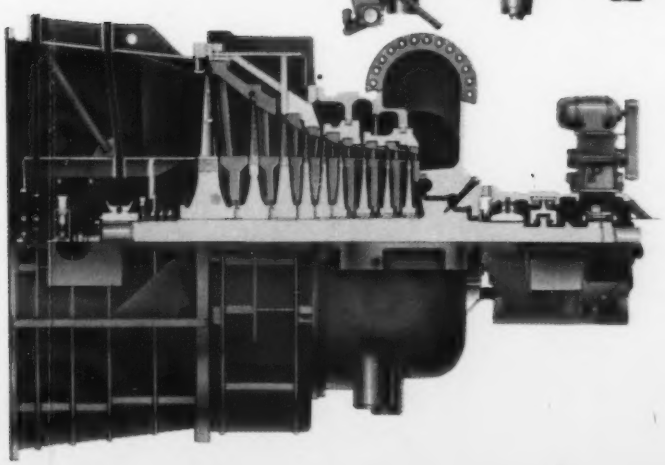






3600-/1800-rpm,
cross-compound, single-flow,
reheat steam turbine

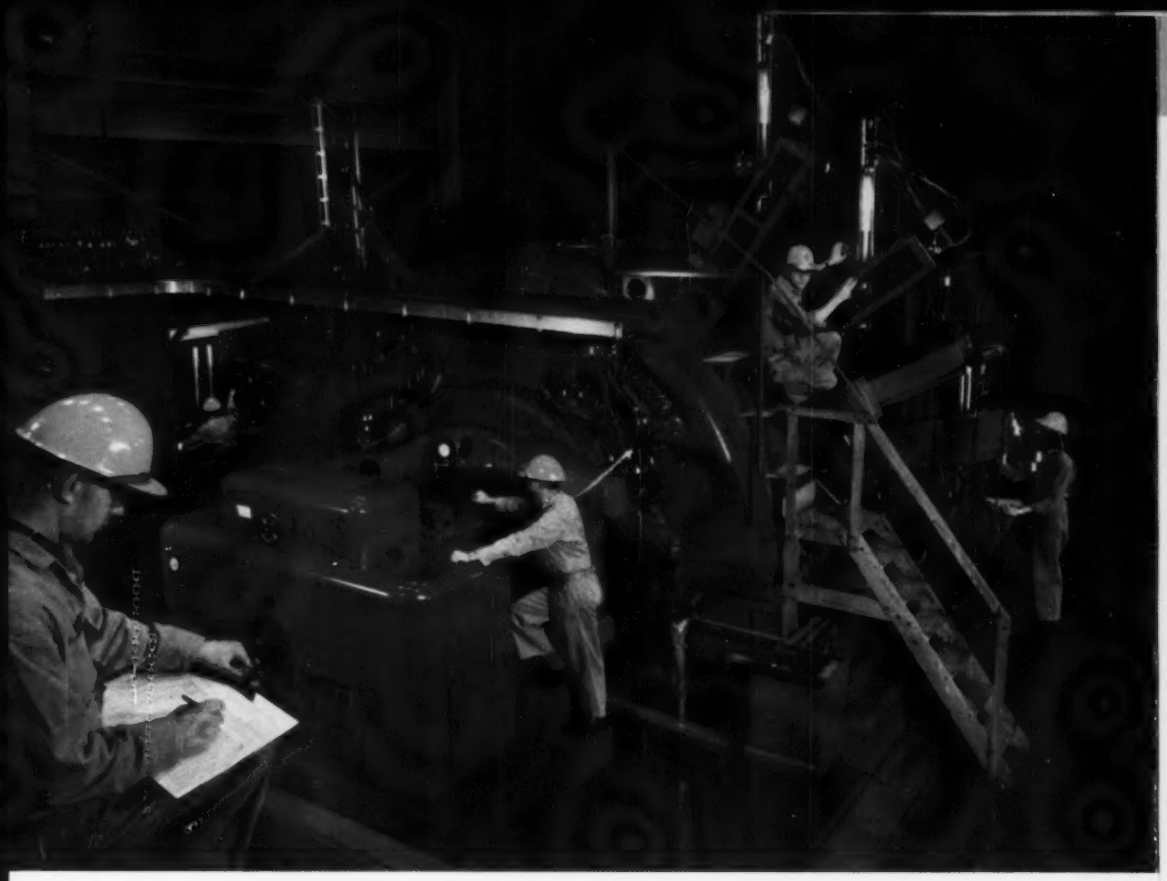




Pre-engineered Steam Turbines for the '60's

100,000 to 600,000 kw

GENERAL ELECTRIC



Why General Electric Offers More For Your Steam Turbine-Generator Dollar Investment

Performance

General Electric's progress in attaining higher operating pressures and temperatures and increased component efficiencies is helping to assure further improvement in the coal rate of electric utilities. With the ever-increasing demand for improved performance, a continuous and diversified program of product development is being carried on in the company's research and development laboratories.

Reliability

General Electric's intensive basic research and development, sound engineering design, modern manufacturing techniques and proper operating practices contribute to the reliability of large steam turbine-generators.

Work performed at the Large Steam Turbine-Generator Department's Materials and Processes Laboratory and the Product Development Laboratory spearheads these efforts.

Service

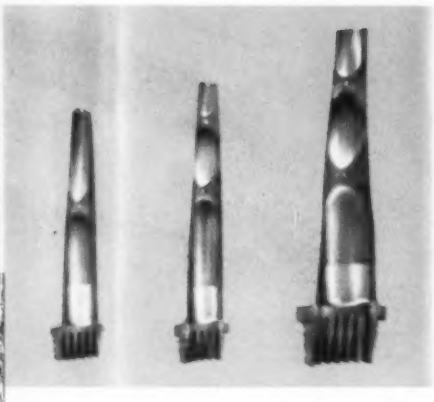
Completely integrated service—from initial order throughout the unit's operating life—is part of the "added value" purchased with each General Electric steam turbine-generator.

Two-way communication of service information through the turbine-generator Product Service organization enables factory know-how to supplement the efforts of field service representatives, and permits factory specialists to take full advantage of field operating experience.

Improved performance, greater reliability and completely integrated service mean more economical generation of electricity.

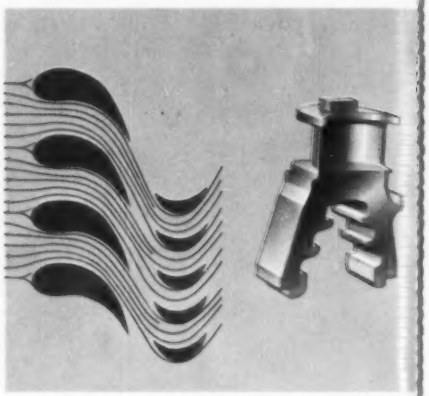
GENERAL ELECTRIC

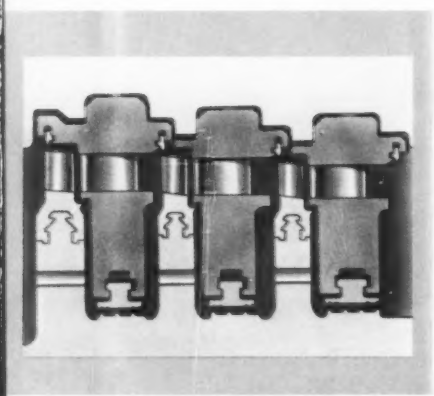
Important Evaluation Features Of General Electric Pre-Engineered Steam Turbines . . .



Progressive Bucket Design

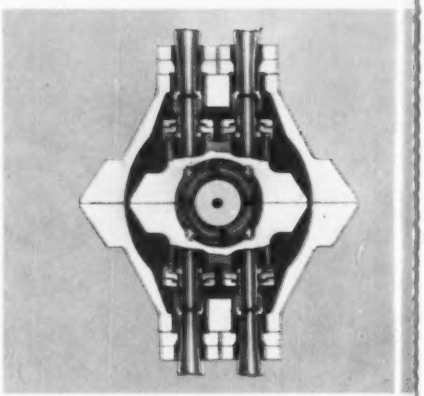
Impulse-Type, Solid Rotor Construction





Removable Radial Spill Strips and Spring-Backed Shaft Packing

Nozzle Box Construction

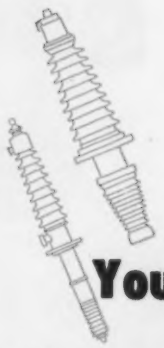


. . . What They Mean To You

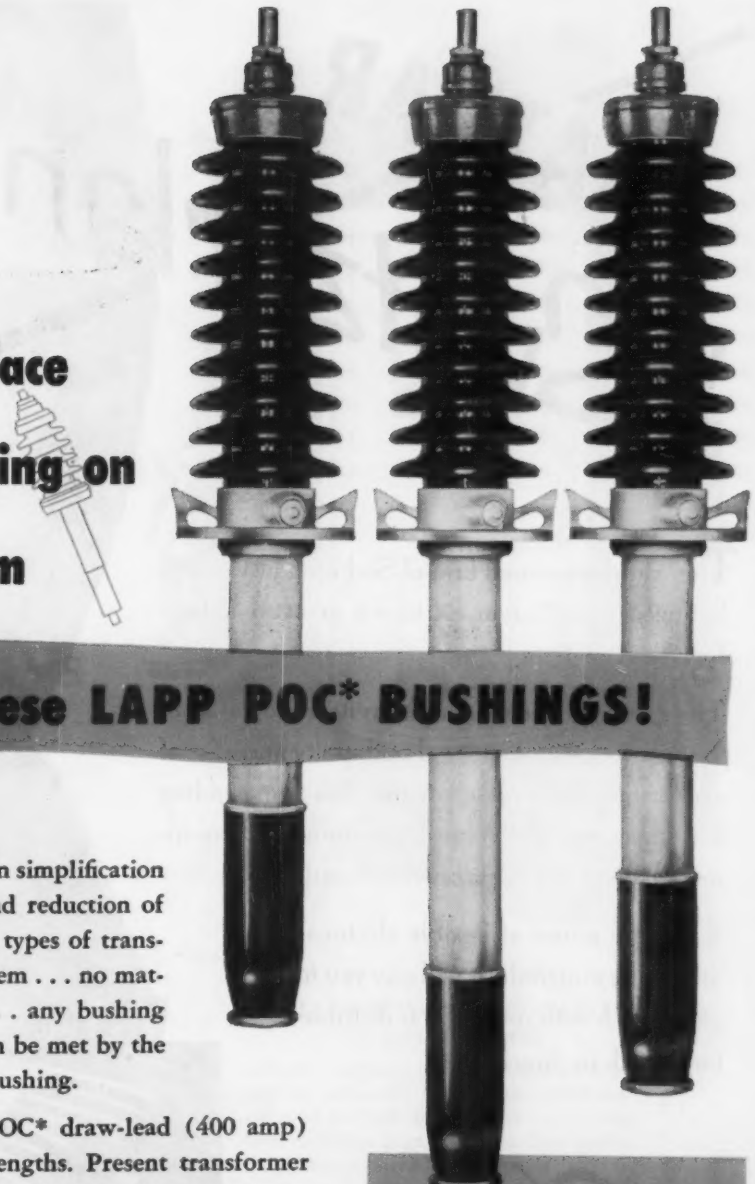
- Minimized Investment
- Improved Performance
- Simplified Operation
- Increased Availability
- Greater Reliability
- Accelerated Installation
- Reduced Maintenance
- Extended Life

Progress Is Our Most Important Product

GENERAL ELECTRIC



You can replace *any* draw-lead bushing on your 69 kv system



with one of these LAPP POC* BUSHINGS!

Here's a real saving for you in simplification of warehouse inventories and reduction of costs! No matter how many types of transformers may be on your system . . . no matter how old they may be . . . any bushing replacement requirement can be met by the Lapp POC* ASA Standard bushing.

At 69 kv, for example, the Lapp POC* draw-lead (400 amp) bushing is made in just three shank lengths. Present transformer designs call for these bushings. On any older transformer using a pre-standard bushing, one of these will also fit perfectly; all that is required is a simple flange adapter which provides for differences in mounting details, and for length and clearances.

Lapp can supply POC* Bushings for your stand-by stocks in voltage ratings 15 kv to 161 kv. Also, we'll design and supply, at nominal cost, non-magnetic flange adapters which will adapt these ASA Standard bushings to every transformer on your system. Give us data on the transformer bushings you now have in service. Let us show you the economies you can effect by reducing your entire stock of spare bushings to the required sizes of Lapp POC* Bushings and a suitable assortment of flange adapters. You'll never be without the replacement bushing you need, and you will save spectacularly in warehouse space . . . in stock maintenance labor costs . . . in investment in inventory. Lapp Insulator Co., Inc., Le Roy, New York.

Lapp

POC* BUSHING

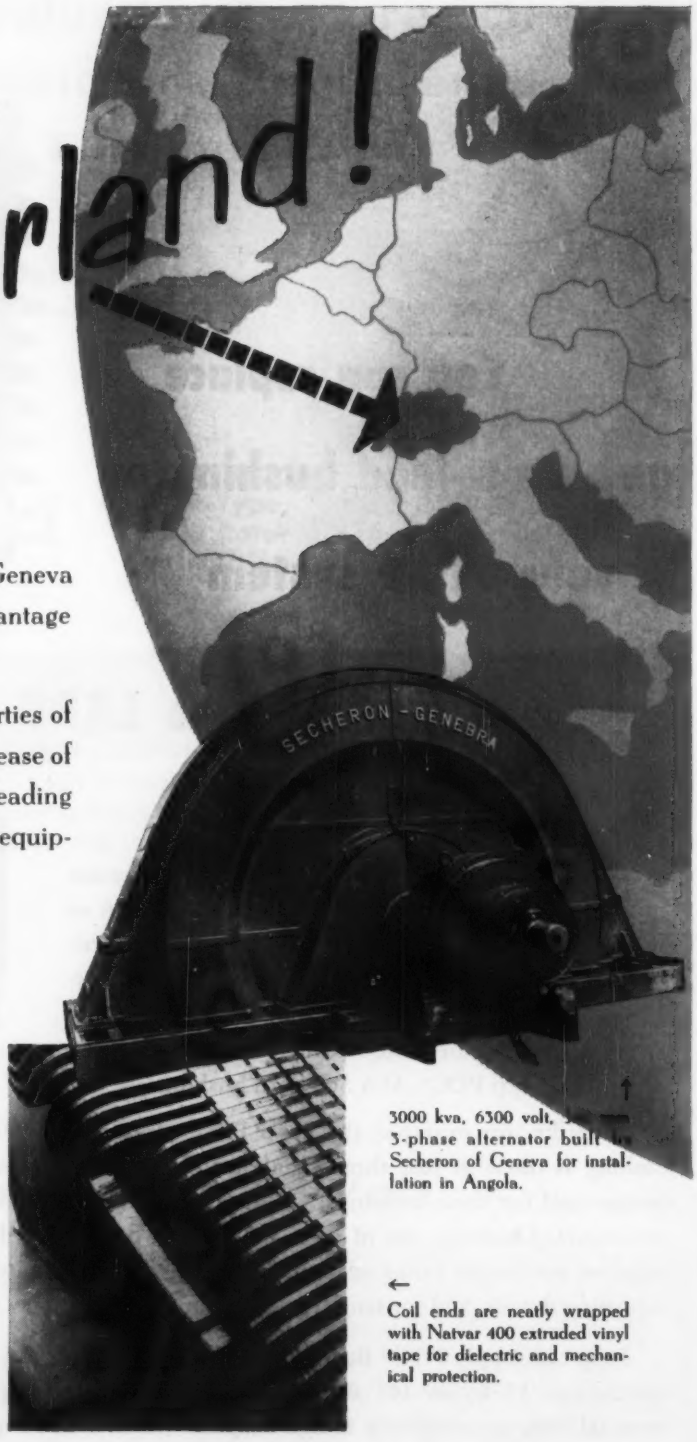
*PAPER-OIL CONDENSER TYPE
TOTALLY-ENCLOSED CORE
ASA STANDARD

NATVAR in Switzerland!

The world renowned firm of Secheron in Geneva has been using Natvar 400 tape to great advantage for years.

The excellent electrical and physical properties of Natvar 400, its exceptional uniformity and ease of application, have made it the choice of leading manufacturers of electrical apparatus and equipment both in this country and abroad.

If you are a user of flexible electrical insulating materials, it will pay you to get in touch with your Natvar distributor or with us direct.



3000 kva, 6300 volt, [illegible] 3-phase alternator built by Secheron of Geneva for installation in Angola.

← Coil ends are neatly wrapped with Natvar 400 extruded vinyl tape for dielectric and mechanical protection.

Natvar

- Varnished cambric—sheet and tape
- Varnished canvas and duck—sheet and tape
- Varnished silk and special rayon—sheet and tape
- Varnished papers—rope and kraft—sheet and tape
- Varnished, silicone varnished and silicone rubber coated Fiberglas*—sheet and tape
- Slot cell combinations, Aboglas®
- Isoglas® sheet and tape
- Isolastane® sheet, tape, tubing and sleeving
- Vinyl coated and silicone rubber coated Fiberglas tubing and sleeving
- Extruded vinyl tubing and tape
- Styroflex® flexible polystyrene tape
- Extruded identification markers

*T.M. (Reg. U.S. Pat. Off.) OCF Corp.

We will be very happy to supply information on any of our products on request.

NATVAR CORPORATION

FORMERLY THE NATIONAL VARNISHED PRODUCTS CORPORATION

TELEPHONE FULTON 8-8800 — CABLE ADDRESS NATVAR: RAHWAY, N. J.

221 RANDOLPH AVENUE • WOODBRIDGE, NEW JERSEY

PUT FULL HOUSEPOWER TO WORK

Fast Recovery For Faster Selling, Greater Loads

Water heaters, with an average annual load factor of 47% and an average annual usage of 3600 KWHR, build loads and profits better than any other household appliance. And, to help you add more of this important business to your lines, Hotpoint offers 40-gallon round and table-top models with the fast recovery today's consumer demands. They provide 470 gallons of hot water every 24 hours—more than 6 times the average family's daily requirements. And, they save space and money by eliminating large storage tanks. Display and promote Hotpoint fast-recovery water heaters for greater earnings.

Model WBA42-1

15-YEAR WRITTEN PROTECTION PLAN ON DELUXE MODELS

One-year warranty on the complete heater, and an additional 7-year replacement warranty on the tank, plus an additional 7-year tank exchange plan. 10-year written protection plan on "Silver Line" Models.

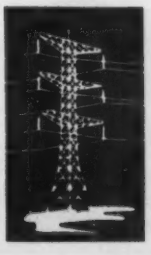
Additional Hotpoint features your customers will want:

LIVE BETTER ELECTRICALLY

MIRACLE MLC-7 ADDITIVE fights rust and corrosion, can lengthen tank life as much as 200%, depending on condition of water.

GENUINE CALROD® MAGIC CIRCLE® HEAT—the most widely used heating units in the world. Famous for efficiency and long life.

PROVEN LEADERSHIP—over ⅓ of all electric water heaters have been made by Hotpoint, and less than 1% have ever needed service.



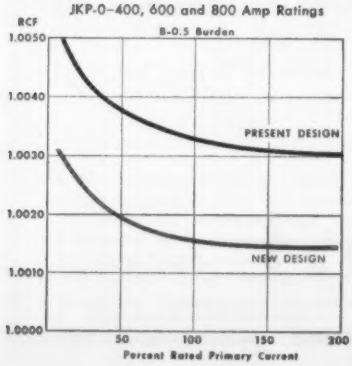
LOOK FOR THAT **Hotpoint** DIFFERENCE

A Division of General Electric Company, Chicago 44, Illinois

From General Electric . . .

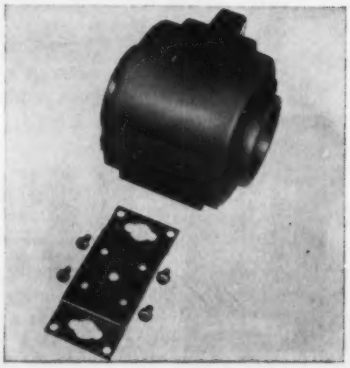
NEW DIMENSIONS in

ADDITIONAL PLUS FEATURES



HIGHER ACCURACY

In pacing industry trends toward better performance at higher loads, G-E engineers have improved JKP-O current transformer accuracy at higher burdens. New models now give 0.3 accuracy at B-0.1, B-0.2, and *B-0.5* in 400:5, 600:5, 800:5 ampere ratings.



MAXIMUM MOUNTING FLEXIBILITY

Removable, stainless-stee base plates, held in plac by four screws positione in a square 1½ inches o center, can be rotated 9 degrees relative to th transformer. Consequent ly, JCA-O and JKP-(transformers can be indi vidually- or gang-mount ed more easily.

Current Transformer Design

Now, G-E Current Transformers Provide UP TO 50% MORE USABLE CABLE AREA

General Electric's line of job-proven 600-volt indoor-outdoor current transformers has taken on new dimensions. The window diameter on G.E.'s 200-amp JCA-O model has been increased from 1 inch to 1 3/16 inches. The 400-amp model window diameter has been increased from 1 5/16 inches to 1 1/2 inches.

In the General Electric JKP-O current transformer line, window diameters have been increased to 2 3/8 inches on 200-amp models and to 2 3/4 inches on the popular 400:5, 600:5, 800:5 models. These larger ratings will easily accommodate *two* 750 MCM cables or *three* 500 MCM cables. This window diameter increase provides up to 50% more area for cable installation.

In addition, the full circular G-E current transformer window opening permits: 1. easier cable insertion to reduce installation time; 2. better cable self-alignment within the window, thereby reducing the amount of mechanical stress and physical strain exerted on the transformer; 3. faster hook-up in restricted areas where cable must be wrapped in a small box.

Improved Design Provides Higher Accuracy, Greater Mounting Flexibility and Color-coding

In pacing industry trends toward better performance at higher loads, General Electric engineers have improved JKP-O current transformer accuracy at higher burdens. Both JCA-O and JKP-O transformers feature detachable, interchangeable base-plates which facilitate either individual or gang-mounting.

Oversize stainless-steel nameplates, color-coded in conformance with EIA standards, permit fast transformer identification in stock or in service. On JKP-O transformer nameplates, key current ratio numbers are printed large enough to be read at a distance of 60 feet.

G-E Current Transformers Still Offer The Advantages of Butyl-molded Construction

General Electric current transformers are butyl-molded to assure long, low-maintenance service. Mechanically strong, butyl also acts as a tough, resilient moisture and oxidation-resistant insulation.

Primary and secondary polarity marks, permanently molded into the butyl casing and painted white, facilitate transformer installation.

Contact Your G-E Apparatus Sales Representative For Complete Ordering Information

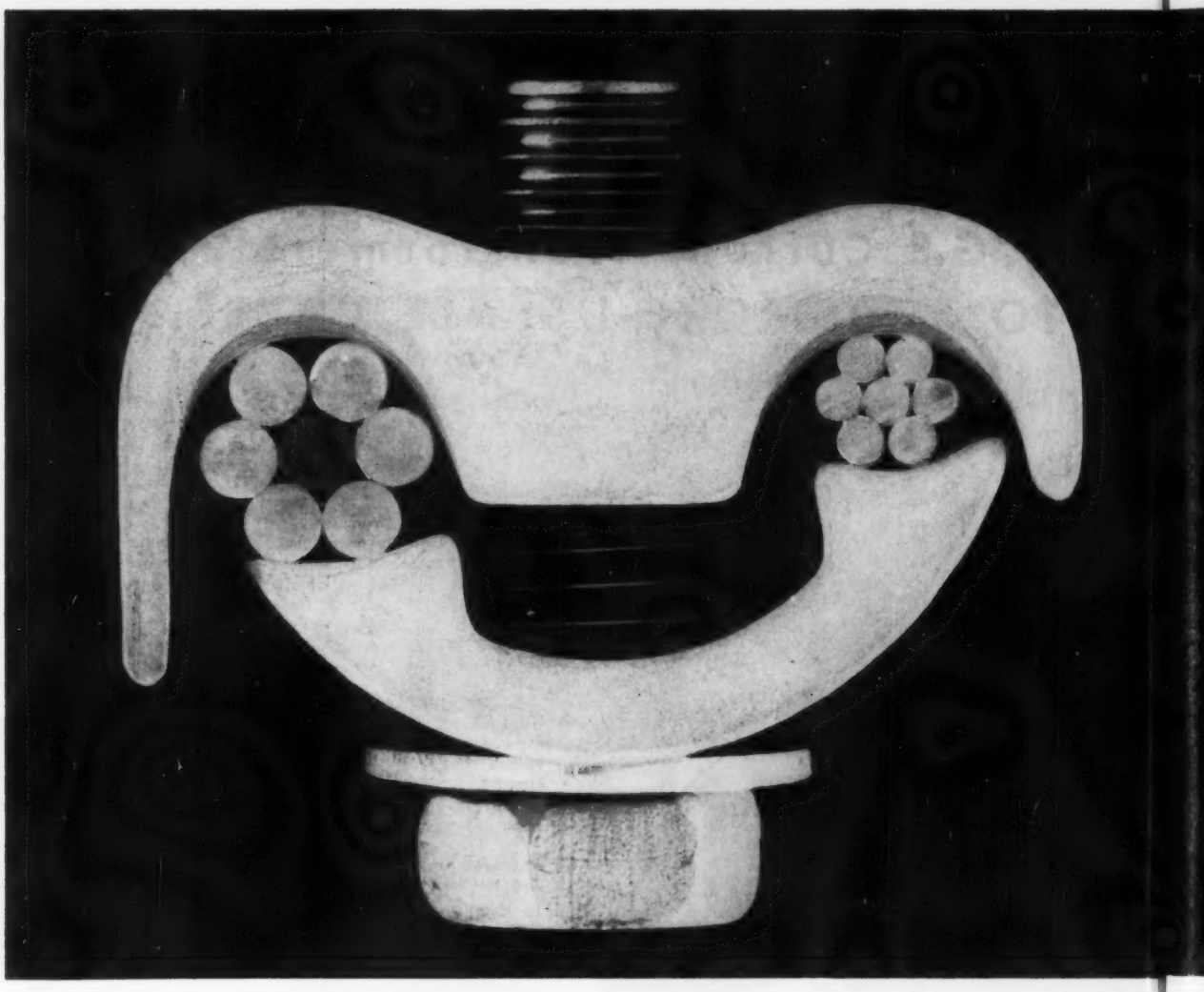
Your General Electric apparatus salesman has complete ordering information on the new line of G-E JKP-O and JCA-O current transformers. He's ready to take your order right now! For more information on the new transformer models, write to Section 629-1, General Electric Company, Schenectady 5, New York.

COLOR-CODED NAMEPLATES

Stainless-steel nameplates, color-coded to EIA standards (red—200 amps, yellow—400 amps, blue—600 amps, grey—800 amps) permit quick transformer identification. On JKP-O models, key current ratio numbers can be read from a distance of 60 feet.

Progress Is Our Most Important Product

GENERAL ELECTRIC



NEW ALCOA CLAMP

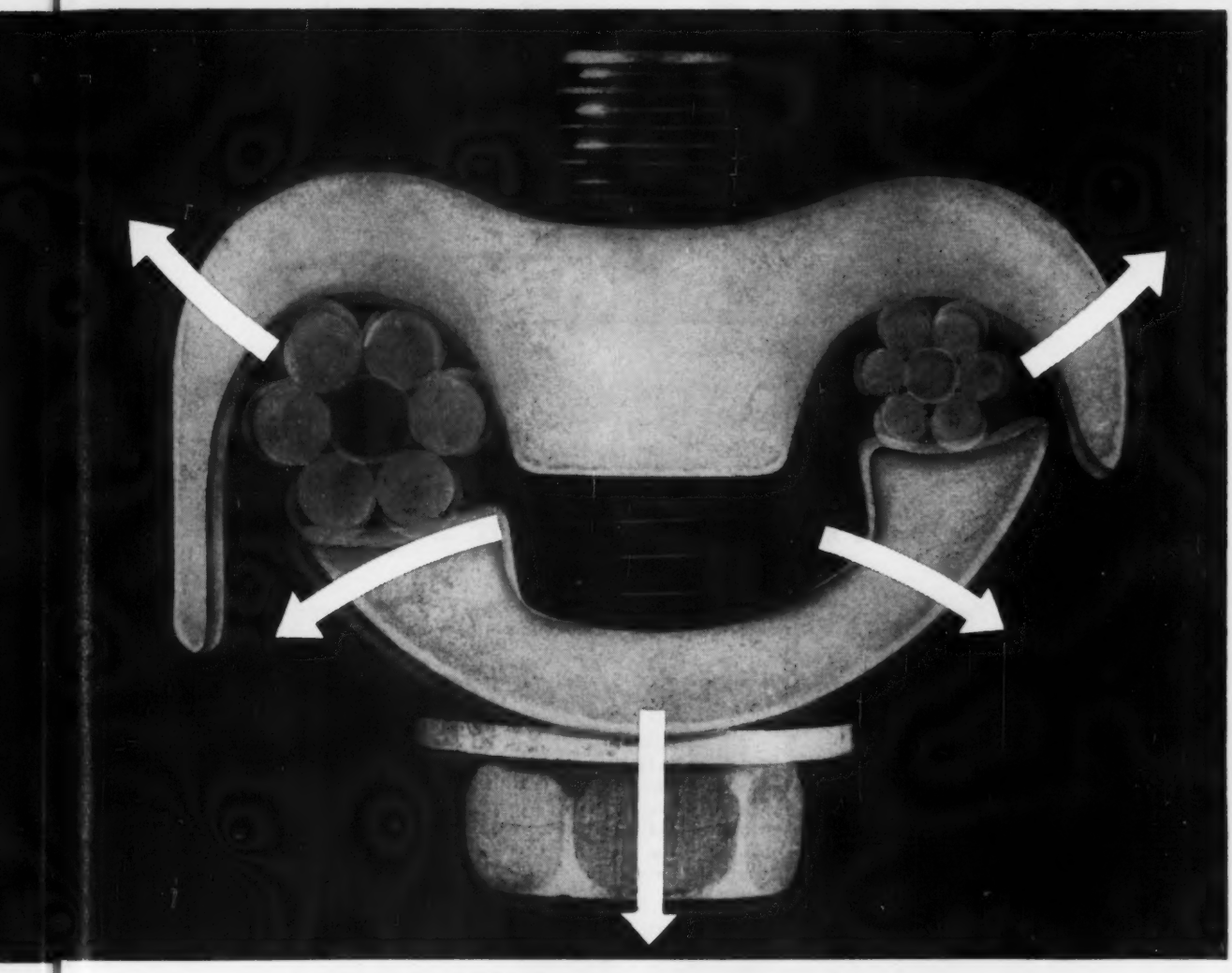
Alcoa Clamps and Connectors Flex with Thermal Changes to Provide Safer, Longer Lasting Connections

Exclusive flexing-action design of Alcoa clamps and connectors gives good conductor contact regardless of thermal changes . . . eliminates the costly problems caused by excessive relaxation.

Here's how this works:

During normal, gradual temperature increases, excess pressure on the conductor is avoided by even expansion throughout the Alcoa clamp. Because Alcoa clamps and connectors are all-aluminum, including the bolt, all components have the same coefficient of expansion.

Alcoa clamps and connectors also adjust during



Above is a pictorial representation of the flexing action Alcoa clamps undergo during thermal changes in conductor. This automatic built-in protection, exclusive with Alcoa clamps and connectors, permits the clamp to "breathe" with changes in pressure.

ACTUALLY "BREATHES"

current surges which cause sudden heating with insufficient time for temperature distribution. In these cases, the flexing action of the spring-like cap member and the stretch action of the aluminum bolt (which is three times that of steel hardware per unit of force) combine to ride with changing mechanical pressures. As cooling occurs, the Alcoa clamp *follows up*, retaining pressure to provide a stable electrical connection.

The entire line of Alcoa extruded clamps and connectors—both light and heavy duty—incorporates this exclusive flexing-action design principle. Why not ask an Alcoa sales engineer to show you what this unique feature can mean to you in terms of safer, longer lasting, maintenance-free installations. Aluminum Company of America, 2110-D Alcoa Building, Pittsburgh 19, Pa.

Your Guide to the Best in Aluminum Value

ALCOA ALUMINUM

For Exciting Drama
Watch "Alcoa Theatre,"
Alternate Mondays, NBC-TV,
and "Alcoa Presents,"
Every Tuesday, ABC-TV

New Chance Type RT REGULATOR BY-PASS SWITCH

meets All NEMA requirements for SPST hookstick

Does the work of 3 SPST switches

and does it in automatically controlled sequence

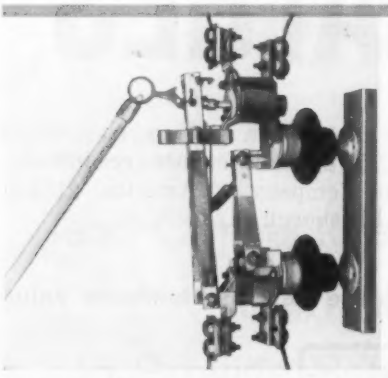
All the switching steps required in by-passing and isolating voltage regulators are performed in automatically controlled sequence by this new Chance Type RT Switch. This single unit does the work of three SPST hookstick switches in (1) by-passing the regulator (2) disconnecting both leads and (3) interrupting the exciting currents.

The Chance RT Switch has been designed to meet *all* NEMA standards applicable to the SPST hookstick switches, including all short time current ratings. Thus, you have the security of full NEMA ratings, plus simplified and completely controlled operation.

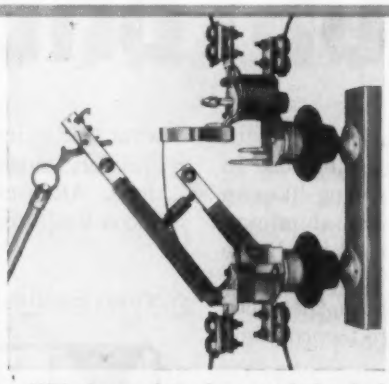
Outstanding performance features of this new design are its ruggedness and its ability to withstand the mechanical and thermal shocks of high current surges. The blade-over-blade design eliminates eccentric forces on spacer insulators. Epoxy resin gives resiliency to the attachment of studs in the spacer insulators to resist the mechanical shock of slam-bang operation or heavy faults. Contact engagement is secure in both closed and by-passed positions.

These disconnects cannot be opened under load, because blades cannot move to open position until the regulator has been by-passed . . . and the recloser cannot be left by-passed in reclosing.

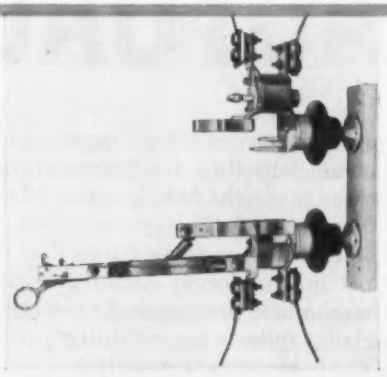
Chance Type RT Switches are more economical . . . are easier to install . . . more reliable, less hazardous and require less space than a comparable installation of single-throw disconnects. They can be used with all regulators that can be set in neutral for switching. Ask your Chance Representative, or write for Bulletin 280 for full information.



1. A pull on the ring disengages the blade latch—pulls the shunt bar into by-pass position between the shunt contacts (housed in the upper spacer insulator).

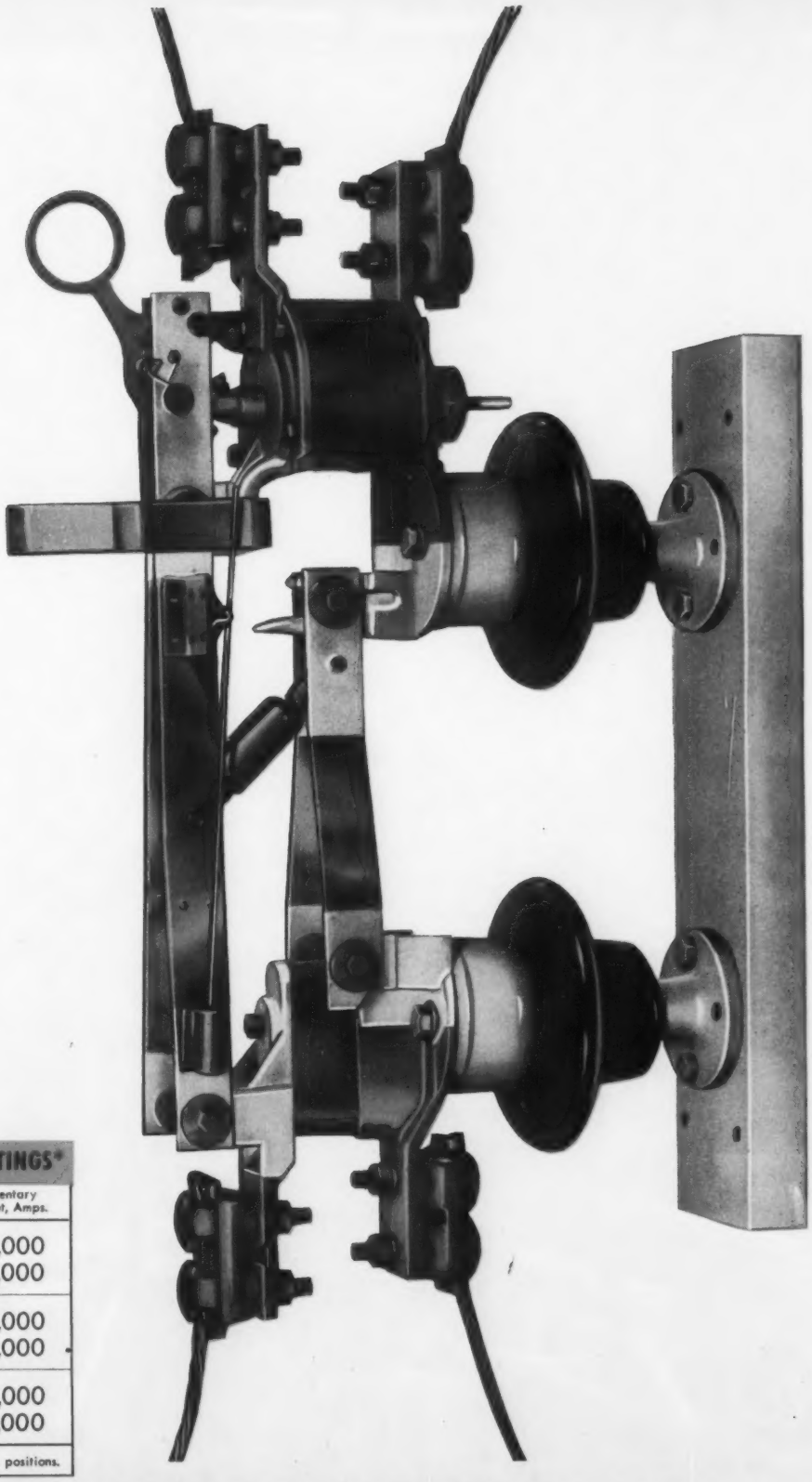


2. With the regulator by-passed, the dual blade continues downward travel, opening both disconnects. Arcing horn still maintains contact.



3. As the blade moves to full open position, snap-out arcing horn whips open to interrupt the exciting current. In reclosing, the sequence is reversed.

switches



CHANCE TYPE RT SWITCH RATINGS*

Voltage	Continuous Current, Amps.	Momentary Current, Amps.
7.5 KV	400 600	20,000 40,000
15 KV	400 600	20,000 40,000
23 KV	400 600	20,000 40,000

*Ratings apply to both closed and by-passed positions.

A. B. CHANCE COMPANY CENTRALIA, MISSOURI

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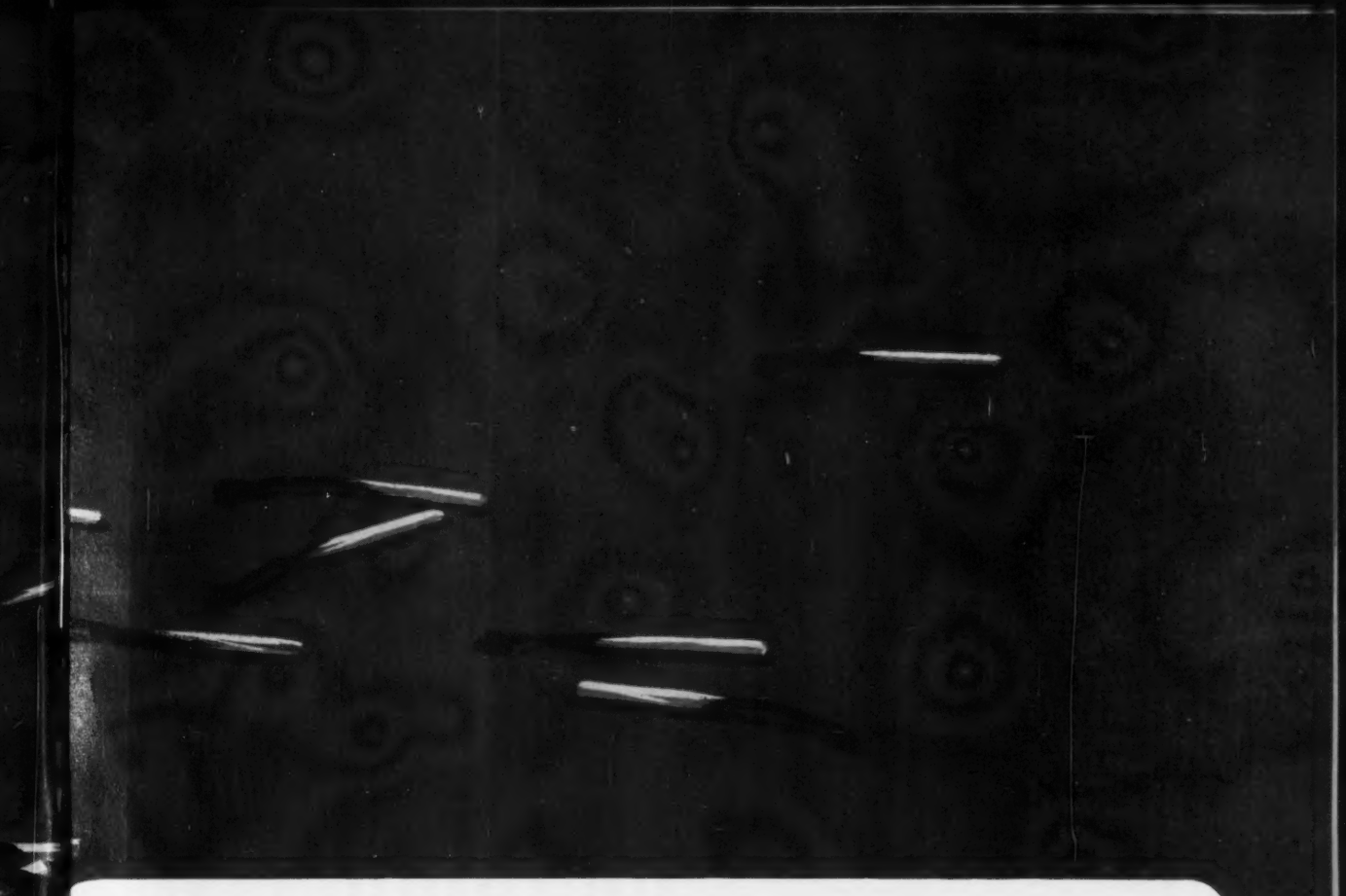
CB59-7

The Continuing Search For Economical Energy



Now—Btu's from coal that "Can't Be Burned"

Utilities who thought it couldn't be done, are now burning low-cost, low-grade, high-ash coal—helping to keep kilowatts America's biggest bargain.

The reason? B&W fuel research that led to the design of the Cyclone Furnace. Fact is, the B&W Cyclone Furnace was *designed* to burn the really "tough" coals—and squeeze the maximum Btu's from every pound.

Behind the Cyclone's success are more than 33,000 B&W fuel analyses. With this tremendous background and experience, B&W can build fuel burning equipment around the fuel *you'll* burn. It means you can utilize available low-cost fuels you could never use before.

Important to you, too, is B&W's complete objectivity in making recommendations. For B&W manufactures all types of fuel burning equipment—for every application. Why not discuss your special requirements with us now. Write to The Babcock & Wilcox Company, Boiler Division, Barberton, Ohio.

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G909-CS

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General Electric medium transformers are CERTIFIED to deliver full value for your transformer dollar

When considering the purchase of your next medium* transformer, we challenge you to examine the *complete "package"* offered by General Electric. Only when you evaluate all three—product, shipment, and service—can you be sure you are getting *full value* for your transformer dollar. To emphasize the importance of this over-all evaluation concept, General Electric has developed the Certified Full-value Transformer Program. All General Electric medium transformers (including RM—repetitive manufacture units) are certified to deliver full value in terms of specific basic design and features . . . plus faster order handling and shipment . . . plus complete service before, during, and after installation. Evaluate your transformer purchases in this way and we're confident you will recognize G-E superiority.

Over 70 years of experience in the transformer field stand behind the engineering, manufacturing and research skills and industry-oriented business concepts which contribute to G-E transformer leadership. **Superior design, features, and performance** means that General Electric is first with major product developments such as interchangeable bushings, new lower losses, and an improved mechanical pressure-relief device. **Faster shipment** means that combined benefits of a large force of G-E sales engineers, computer design capabilities, and repetitive manufacturing facilities result in substantially shorter shipping cycles. **Complete service** by a staff of field-based General Electric application and installation engineers and a network of 50 conveniently located service shops is unduplicated anywhere in industry today.

Your G-E Apparatus Sales Engineer can show you all the ways you get full value for your transformer dollar. Ask him today. General Electric Company, Schenectady 5, New York.

416-25

* 501 to 7500 kva, 69 kv and below.

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STANDARD TYPES	**Power Cables (600-5000 Volts) single and multiple conductor — braided, interlocked armored or with lead sheath. Lighting Wires, Motor Lead Wires, Control Cables.**	Power Cables (600 & 5000 Volts) single and multiple conductor — braided, interlocked armored or with lead sheath.	**Power, rheostat, apparatus cables solid, stranded, flexible and extra flexible. 600 and 300 Volts.**
APPLICATIONS	**Recommended for severe operating conditions in high ambient locations. For wet locations specify this construction with lead sheath. N.E.C. Type AVL.** **For details ask for catalog 10G and the AVA Manual (RMI 657).**	Recommended for secondary leads from power centers to bus ducts in armored construction. For wet locations specify lead sheath type VL or impervious sheathed armored cables. For details ask for catalog VC56.	**Recommended for wiring in high ambient, dry locations as outlined in National Electrical Code.** **For details, ask for catalog AW55.**

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Power Stations
Glass Factories
Pottery Plants
Boiler Rooms
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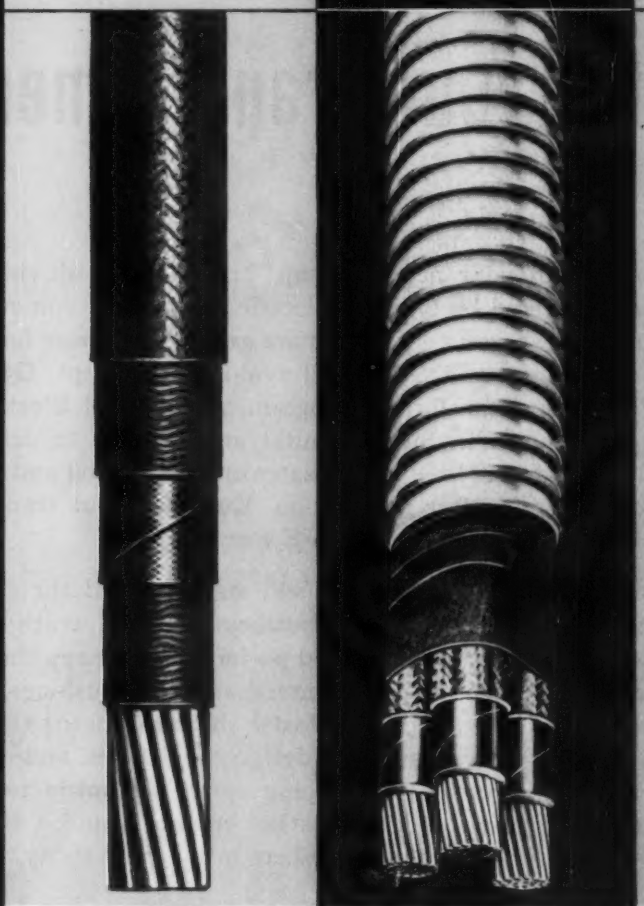
Refineries



Max. Operating Temperature 230°F (110°C) Rockbestos A.V.C. — N.E.C. Type AVA — asbestos, varnished cambric insulated	Max. Operating Temperature 185°F (85°C) Rockbestos Varnished Cambric — N.E.C. Type ACV, V	Max. Operating Temperature 257°F (125°C) AIA 392°F (200°C) AA, A Rockbestos All-Asbestos Insulated — N.E.C. Type A, AI, AA and AIA

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**Teflon-duPont Reg. TM for "tetrafluoroethylene" resin*

PNR Control Cables 600 Volts.	**Power Cables 600 & 5000 Volts. Control Cables, Class H Motor Lead Wire, Heating Cable, Defroster Wire, Appliance and Fixture Wire.**	Switchboard wires, hinge cable, bus cable (600 Volts).
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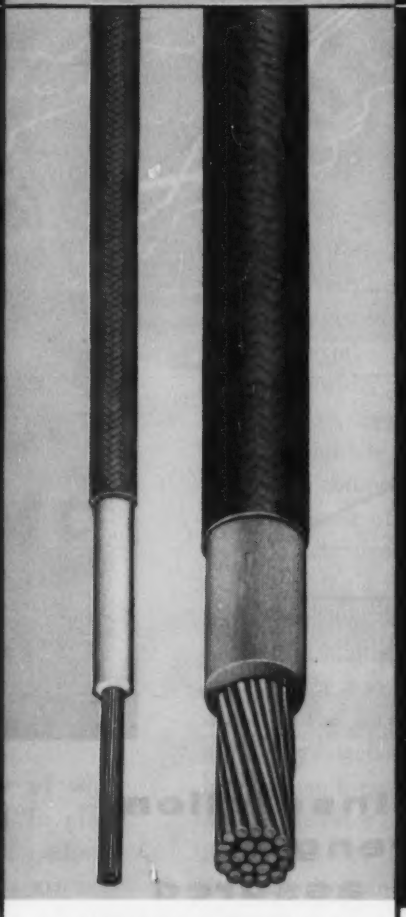
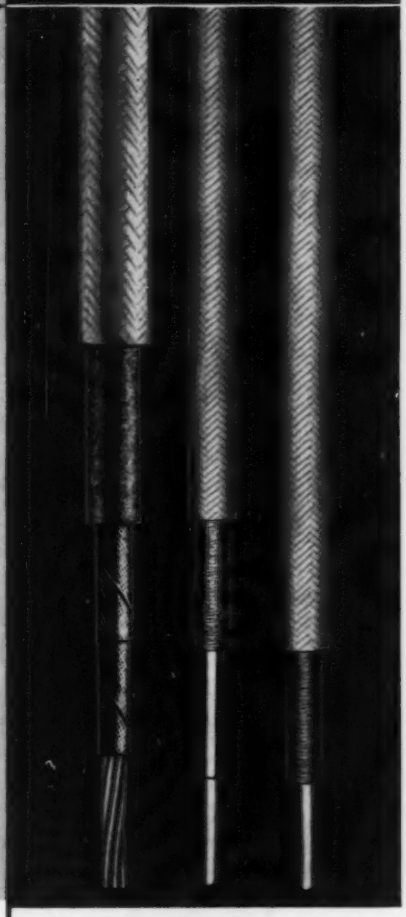
Rockbestos PNR — small diameter — saves conduit space. These Rockbestos control cables are recommended for use in conduit, direct burial or exposed overhead applications. Recommended for station control cable circuits. Combinations of polyethylene and PVC to IPCEA Standards 600 & 1000 Volts. For details, ask for catalog CC-58.	**Unrestricted in application — use in wet or dry locations in high ambient operating temperatures. Silicone rubber eliminates necessity for lead sheath.** **For details, ask for catalog SR-58.**	Underwriters' approved switchboard wires. Recommended for switchboards, control panels, induction heating apparatus, hinge and jumper connections on swinging instrument and synchronizing meter panels, etc. For details, ask for catalog 10G.
		
Max. Operating Temperature 167°F (75°C) **Rockbestos PNR-(polyethylene, nylon and polyvinylchloride) insulated**	**Max. Operating Temperature 257°F (125°C)** **1. Rockbestos silicone rubber insulated appliance and fixture wire** **Max. Operating Temperature 392°F (200°C)** **2. Rockbestos silicone rubber insulated motor lead wire**	**Max. Operating Temperature 194°F (90°C)** **1. Asbestos, varnished cambric — Type AVB** **2. Thermoplastic and asbestos — Type TA** **3. Thermoplastic Insulated — Type TBS**

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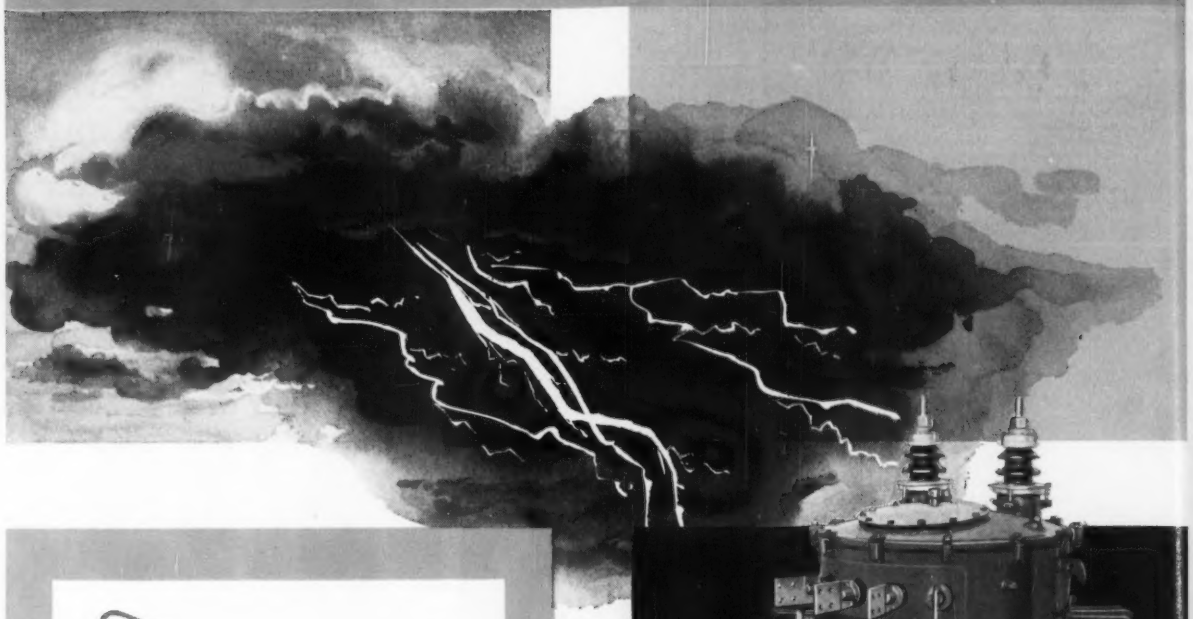
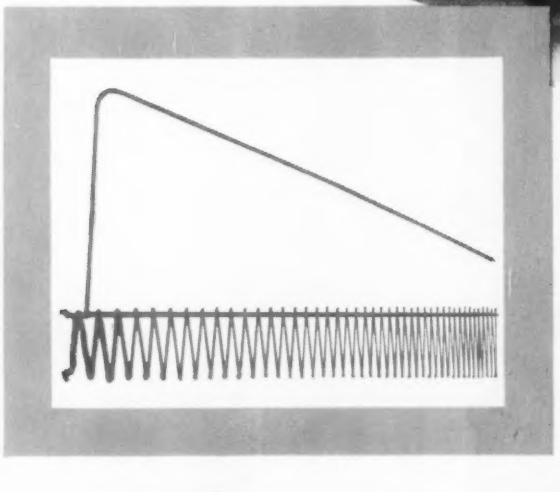
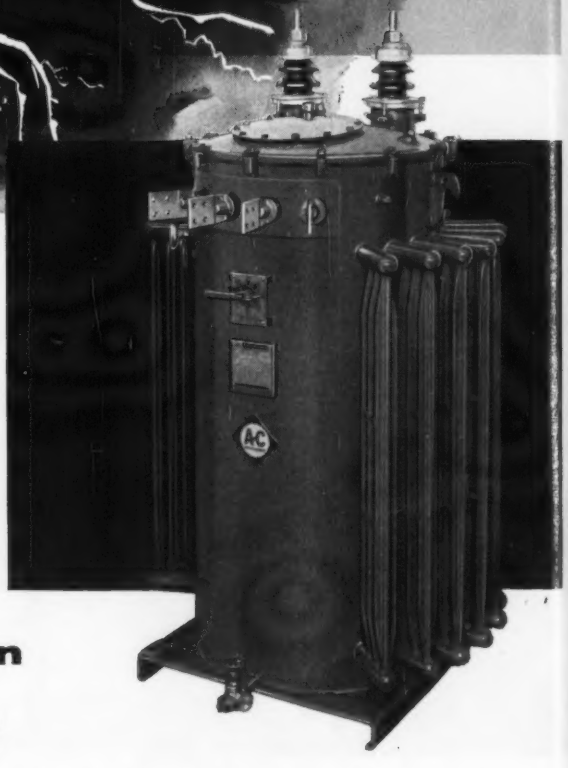
ALLIS-CHALMERS modern line for '59







Insulation strength assured

Automatic fault detector oversees impulse tests of Allis-Chalmers distribution transformers

Even the smallest fault triggers a flashing red light and an alarm bell. Thus the new automatic fault detector eliminates human error in impulse testing. What better assurance that overall insulation strength meets all standards—that insulation will withstand severe lightning and surge conditions!

Every Allis-Chalmers distribution transformer, from 5 to 500 kva, is impulse tested on the production line. The record of operating reliability proves the wisdom of this policy. Call your A-C man for details, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

Plan to stay ahead... MODERNIZE

ALLIS-CHALMERS

A-5906

The Power Companies' Troubles

J. E. Corette, president of the Edison Electric Institute, recently enumerated some of the tough problems which utilities face. All have been covered many times before, but we think them worth repeating in the words of Mr. Corette.

"In my judgment, nothing in recent years is more serious than the effort of the Internal Revenue Service for tax purposes and the Federal Power Commission for rate purposes to eliminate certain advertising expenses from the classification of ordinary and necessary business expenses. This was all started by a communication from Senator Kefauver to those two agencies, which resulted in a tentative conclusion by the staffs of IRS and FPC that all of the ECAP advertisements in the IRS case and about 45% of those in the FPC case are propaganda and therefore not deductible.

"This is an outstanding example of what comes from centralized government. In plain language, these two federal agencies, by administrative decree, are deciding what ads are necessary in a competitive field and what ads are appropriate business expenses.

"For the last several years over 95% of the farms in America have been supplied with electricity and the REA has expanded into the suburban, commercial and industrial business and into the generation and transmission business. In the past five years, the commercial and industrial business of all REA's has doubled. Now three out of every four new REA customers are non-farm.

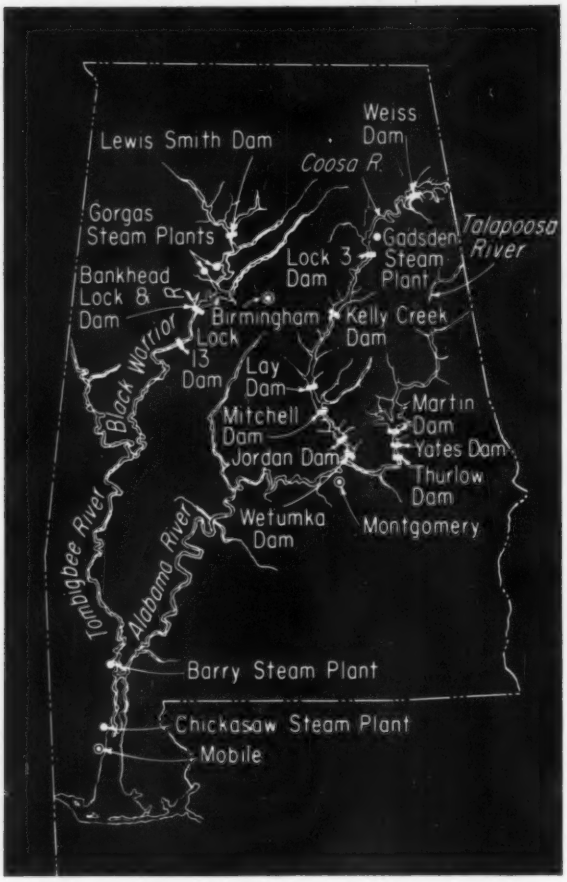
"Nationwide, the REA has completed its original job, has abandoned the concept of its creation and has become probably the most serious major competitor of investor-owned utilities.

"The users of the facilities of the investor-owned electric companies, which constitute 71% of this nation's investment in electric facilities, pay 97½% of the taxes collected from electric properties and operations.

"Another way of putting it is that the customers of the investor-owned electric companies must pay electric bills which are about 30% higher than they would be if there were no taxes on the investor-owned electric companies. On the other hand, the users of power from government-financed and sponsored power projects pay bills which are only 3% higher than they would be if those projects were making no payments in lieu of taxes."

Perhaps your congressman and your neighbor would be interested in these simple facts.

Alabama Power Wins Edison Award



COOSA, WARRIOR RIVER projects include flood control, irrigation in first private backing of major river plan

NEW AWARD replaces 36-yr old Charles A. Coffin Award, provides $1,000 for Alabama Power's employee benefit fund

Industry's top honor conferred for 'exceptional business statesmanship' in complete water resource development on two rivers

Full-scale development by Alabama Power Co of the resources of two rivers has brought the company national recognition. The Edison Electric Institute's new Edison Award was presented to the company at the close of EEI's 27th annual convention last week.

Thomas W. Martin, Alabama Power's chairman of the board, was presented the award by J. E. Corette, president of EEI and Montana Power Co. The Edison Award takes the place of the Charles A. Coffin Award, which was given annually at EEI conventions since 1922.

The company's long-range program for development of the Coosa and Warrior river systems is the basis for winning the industry's top honor.

Work on the Coosa project began April 26, 1958. By 1968 the company will have developed 421,700 kw of new hydro generating capacity on the river for a cost of $121 million. The project is the first full development of a major river undertaken by private resources. At groundbreaking ceremonies last year, Chairman Martin said that "by 1975, new industries with a total investment of not less than $73 million will locate within the development area and that existing industries will make expansions involving not less than $40 million."

Ultimate Capacity on Coosa to be 675 Mw

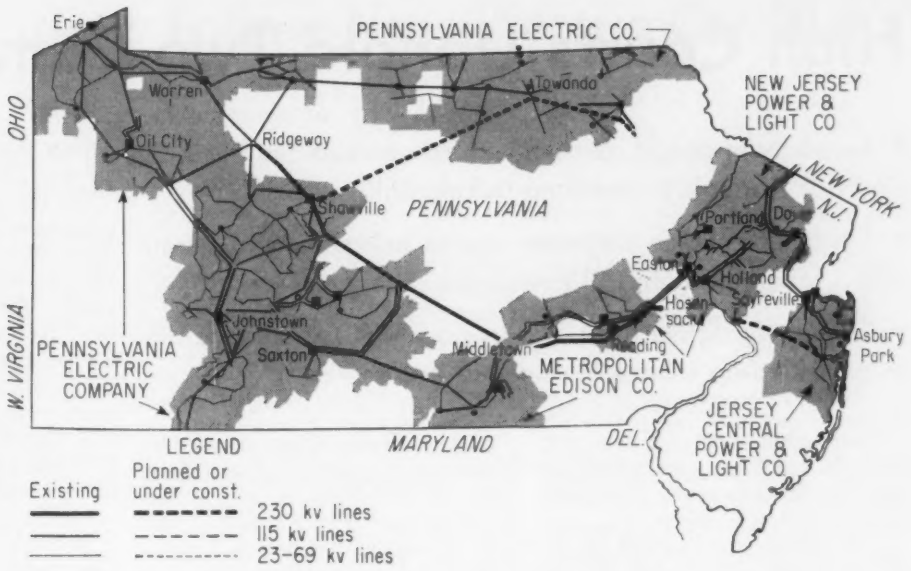
These Coosa River projects plus two existing company installations will utilize the 440-ft head on the 230-mi of the Coosa from Montgomery, Ala., to Rome, Ga. Total capacity will be 675,200 kw.

Warrior River construction includes the Lewis Smith Dam. Alabama Power also has a license to install a plant at the government's Bankhead Lock and Dam. The company's plan for generating facilities at a Black Warrior River navigation dam has been accorded a preliminary construction permit by the Federal Power Commission.

The Edison medal, left, was accompanied by $1,000 for Alabama Power's employees' benefit fund.

The company was cited by the judges "For exceptional business statemanship in conceiving a comprehensive program for the complete development, by use of private investor capital, of the water resources of the Coosa and Warrior river systems in Alabama, for its effective public information program regarding this project, for obtaining necessary Congressional legislation and the approval of federal bodies required to carry it out, thereby providing the State of Alabama with valuable power, navigation and recreational facilities, together with flood control and conservation of the water resources of the State, all accomplished without major controversy and all contributing importantly to the public welfare and the economic growth of the whole State."

GPU system and 3 manufacturers to examine what 'appears to be the next logical transmission voltage' as . . .



Penelec Plans 460-Kv Experiment

Pennsylvania Electric Co disclosed last week its plans to build an experimental, 13-mi, 460-kv transmission line on its system in south-central Pennsylvania to obtain data on construction cost, performance, and operation of extra-high voltage lines. The line, which is to be built in cooperation with a group of electrical manufacturers, will have about 9 mi of wood-pile structures and 3½ mi of various types of steel construction. It will use four different types of conductors.

In announcing the plans at the annual stockholders' meeting of General Public Utilities Corp, Louis H. Roddis Jr, Penelec president, said the company had been studying the possibility of future use of higher transmission voltage.

"It appears", he said, "the next logical transmission voltage is 460 kv, which would be superimposed over the 230-kv system."

Penelec has been installing generating stations within coal fields of western and southern Pennsylvania and transmitting the energy to its own 17,500-sq-mi territory and to other GPU system companies. At the end of 1959 Penelec will have approximately 375 mi of 230-kv and 1,340 mi of 115-kv transmission lines.

Purpose of the experimental 460-kv line will be to combine scientific research with the accumulation of operating experience. The line will be built so that it can be integrated into the company's present network and used under daily operating conditions. It is planned for a rugged, mountainous area south of Johnstown that provides geographical and meteorological conditions representative of the entire Penelec system. This will permit testing equipment under conditions imposed by snow, sleet, and wind conditions as well as severe lightning.

Domestic GPU subsidiaries will assist Penelec by furnishing engineering personnel and technical advice. Penelec is one of five GPU operating subsidiaries.

Three Manufacturers Participate

Three electrical manufacturing companies will supply special equipment for EHV operation. General Electric Co will supply a 115/460-kv transformer for one terminal and switching equipment for both ends. Pennsylvania Transformer Co will supply a 115/460-kv transformer for the other terminal. GE will also supply complete lightning-arrester protection and will join Penelec in carrying out a thorough lightning investigation on the 460-kv line. Ohio Brass Co, as well as GE, will cooperate in designing insulators and insulator hardware. Discussions are being held with manufacturers of other equipment to be used.

Test equipment will be supplied by the equipment manufacturers whose engineering personnel will join Penelec engineers in designing, constructing, and operating the line.

W. R. Swoish, Pennsylvania Transformer vice president, said: "The operational data obtained from studies of the Penelec line will be an important supplement to Pennsylvania Transformer's continuous research and development program. We believe this project will furnish valuable data not only for Penelec and participating manufacturers, but also for the entire electrical industry . . ."

Dr Pier A. Abetti, manager of GE's Project EHV, announced that his organization will join Penelec in the instrumentation of the 460-kv line and in carrying out the study. It is vitally important, Abetti said, that high-voltage research in various areas be coordinated. GE's participation in the Penelec project will assure such coordination with Project EHV, he added.

In concluding his statement to GPU stockholders, Penelec's Roddis said: "It is our belief that . . . this cooperative project will provide very valuable information regarding performance of EHV equipment and transmission lines . . ."

High Courts Uphold Two Companies

- **Authority to cancel contract with co-op sustained by U. S. Court of Appeals in Montana-Dakota Utilities case**
- **Customer's choice on power source brings North Dakota ruling favoring Otter Tail Power over cooperative**
- **On the legislative front, chances are slim for a Texas bill to permit co-op service in annexed areas**

Two recent court decisions may hold far-reaching implications for dealings between power companies and electric cooperatives.

One ruling was reached by the U. S. Court of Appeals for the Eighth Circuit which upheld Montana-Dakota Utilities Co right to cancel a contract with a co-op when the power company later decided the agreement violated the law. The second concerns a North Dakota Supreme Court decision which, in effect, ruled that a customer's choice of his source of power should prevail when two utilities serve the same territory.

Origin of the contract dispute involving Montana-Dakota was a 1952 agreement between the company and Williams Electric Cooperative, Inc. They agreed that the co-op would serve the area around Williston, N. D., and the company would serve the city. A contract provision, however, stated that the company could cancel the contract if it was later found in violation of the law.

Pact Not a PSC Matter, Court Says

After several hassles on who should serve certain customers, the company canceled the contract. The co-op then asked the state Public Service Commission to see that the agreement was enforced and to also block the company's service to customers who allegedly wanted to get co-op service. This issue went to the state Supreme Court. Its decision upheld the company view that the PSC had no jurisdiction to enforce the contract. The ruling also held that Montana-Dakota did not need a certificate to serve the disputed customers since they were in territory next to that already served by the company.

A U. S. District Court suit filed by the co-op then sought alleged damages of $250,000. A jury verdict awarded the co-op $35,000. This was set aside in the Court of Appeals which said that "contracts between quasi-public corporations, having for their object the division of territory between such companies, are against public policy, and being so are absolutely void . . ."

Industrial Load Involves Otter Tail

The issue that involved Otter Tail Power Co and Cass County (N.D.) Electric Cooperative centered on which should serve a Standard Oil Co microwave station. The facility was built across the road from a crossing of the co-op's single-phase distribution line and the company's three-phase transmission line.

Co-op service in the area was sanctioned in 1942 by a legislative measure permitting it and the company to serve customers in the same territory.

This was the framework on which the co-op pegged its claim that it had prior rights to rural customers, and that it was illegal for Otter Tail to extend service without a certificate of convenience. These claims, which observers said were politically inspired, were lodged with the PSC, which ordered the company to stop converting Cass County's customers.

Otter Tail appealed to a lower court which overruled the commission. This decision, then, was appealed to the North Dakota Supreme Court by the co-op and the commission. The high court declared that entry of a co-op into a territory already occupied by a utility does not oust the company from that territory. It only established open competition in which both utilities can solicit business there, and neither can expect government assistance against the other.

On the legislative front, sponsors are pessimistic over chances of passing a bill to let rural co-ops in Texas serve customers in areas annexed to cities. Tom Reavley, Austin attorney representing Texas Electric Cooperative, Inc, told legislators his group doesn't want to expand into new areas but only within areas where co-ops initiated service.

Power company opponents to the bill asserted it was a "promotion of tax-exempt electricity."

William Sedberry of Marshall, representing Southwestern Electric Service Co, said the Texas legislature two years ago passed a law to help co-ops. It permitted them to continue serving customers they had when territory is annexed to a city, but not to solicit new business in the area.

Cities Asked to Delay Co-op Pacts

A similar measure died in committee in the Georgia legislature recently. Since then the Georgia Municipal Assn suggested to cities that they not sign any contracts with REA co-ops until receiving a report from the association.

Specifically, the group noted that the co-ops are asking some cities to enter agreements for co-op service for "varying amounts of gross receipts in lieu of taxes." Such pacts "could jeopardize the position of the Georgia Municipal Assn in trying to protect the time-honored right of franchisement now enjoyed by our cities," the group said in a letter to city managers, mayors and superintendents of municipal electric systems.

New Contract Ends Strike

The one-month strike at Columbus & Southern Ohio Electric Co has been settled for about a 4⅔% increased cost to the company. Appalachian Power Co has signed a 3-yr contract that provides a 4½% boost. Washington Water Power Co's recent pact with IBEW workers increases wages by 4.19%, including nonunion workers also.

Mixed Emotions Follow New Electric Car Plans

Project of American Motors and Sonotone will explore 'revolutionary' concept. Only hitch is that a built-in engine—not household current—would recharge batteries

The announcement April 1 by American Motors Corp and Sonotone Corp that they will explore the feasibility of a "revolutionary" electric car was met last week with mixed emotions.

On the one hand, utilities, generally, were glad that a big car maker was interested in electric vehicles. The research and promotional backing that a firm like American Motors can lend the concept, the utilities reasoned, will speed the electric's comeback.

On the other hand was the announced intent of developing "an electric powerplant which would be constantly recharged during operation by a generator operated by a small high-performance engine." Or, in other words, no off-peak battery charging load.

Key Is Nickel-Cadmium Battery

Key to the success of the joint AMC-Sonotone project hinges on the feasibility of the proposed car's batteries. Sonotone makes sintered-plate nickel-cadmium batteries with, the firm says, the necessary light weight and quick recharging characteristics. Their cost is substantially higher, however, than conventional lead-acid batteries.

Dr L. Grant Hector, Sonotone vice president of technical operations, pointed out that costs of some models of the nickel-cadmium type have been more than halved in the past decade. "If we can do it [halve the price] again, we'll have the problem licked," he said.

Present cost of nickel-cadmium batteries capable of powering an electric car was estimated at $2,000 by one informed source.

This, presumably, is a chief reason for the caution expressed by George Romney, AMC president. The program could take several years and it might not result in a vehicle which would prove feasible and economical, he said.

Asked about the statement that Sonotone's batteries would last the lifetime of the car, Dr Hector replied that this is based on "reasonable assumption." Batteries produced by the Elmsford, N. Y., firm a decade ago are still in good operating condition, he said.

A spokesman at Atlantic City Electric Co said he had been assured that American Motors' participation in this new project would not affect AMC's role in another joint effort. AMC is participating with Atlantic City Electric, Cleveland Vehicle Co, Electric Storage Battery Co, and Maust Coal Co on tests of a Rambler converted to electric power (EW, Feb. 16, p 65).

The idea of regenerating a motor while the car is driven is too "futuristic" said the head of a manufacturing firm interested in making electric cars. Nickel-cadmium batteries discharge quickly and their low voltage requires too many cells for longer period strength, he said.

The vice president of another interested firm favors the all-electric approach. "Otherwise, you're just making another car with an internal combustion engine. What we want is a new design with the advantages of battery power and without the disadvantages of weight, bulk and high-cost operation of today's car."

Other recent developments of the electric include:

- Nic-L-Silver Battery Co of Santa Ana, Calif., has sold an auto to Seattle City Light. The car has a reported driving range of 125 mi on one charge, and carries up to four persons. The Nic-L-Silver unit is 164 in. long and wheelbase is 94½ in. Operating cost for the car is estimated at 5¢ a mi.
- Electricar Mfg Corp, an electric golf cart maker, has announced plans for producing an electric sports car and a sedan. The firm has a plant in Freeport, L. I., N. Y.

Interest Hiked By Bank Display of No. 1

Thousands of Spokane area residents have had a first-hand inspection and hundreds have inquired for more details on Washington Water Power Co's electric car since it was put on display in the First National Bank lobby a month and a half ago. The Experimental Car No. 1, a Crosley converted by WWP Engineer Robert Sewell, has aroused a public reaction "beyond anything we anticipated," a utility spokesman said. The car's original lead-acid batteries have been replaced by selenium batteries, which are lighter and provide a longer operating range. Obviously pleased with the developments, above, are James Brennan, left, bank president, and Albert Gruber, WWP technical research analyst.

Reactor Studies Point to 8-9 Mill Power

Investigation of boiling water, pressurized water and organic-cooled types produce this optimistic estimate and raise question of government or private backing

Some top U. S. designers and manufacturers now are confident they can build large-scale atomic plants producing power for 8 to 9 mills per kwhr.

The next step is for the Atomic Energy Commission and Congress to decide whether the government should back construction of one or more plants to prove out the designs, or wait for private industry to pick up the ball.

And if Congress votes to push construction, a choice probably will be made between the boiling water, pressurized water and organic-cooled types of reactors—all of which show approximately equal promise, in the view of AEC sources.

Hearings Begin This Week

The question will come to a head this week when the Joint Congressional Committee on Atomic Energy resumes hearings on AEC's proposed civilian power program for the fiscal year beginning July 1.

Last year, acting under a committee mandate, AEC let contracts for design studies on the three reactor types. Results have been submitted to AEC, which in turn transmitted them to the joint committee. Commission sources describe the conclusions of the design studies as follows:

- Boiling Water — Ebasco and General Electric say the optimum-size reactor would be 300,000 kw, chiefly because of limitations on the size of available turbines.
- Pressurized Water — Stone & Webster and Combustion Engineering reported the most efficient size for this concept would be 236,000 kw, with limitations imposed by size of both the turbine and the pressure vessel.
- Organic Cooled—The Bechtel Corp and Atomics International concluded that the best rating for this concept would be 300,000 kw. Separate data were offered for a 75,000-kw prototype reactor of the same concept.

Commission sources say that, according to the studies, all three reactor types purportedly could produce power at 8-9 mills per kwhr—a cost low enough to be competitive in some parts of the U. S.

Estimated cost per installed kw reportedly ranged from $150 to $250.

It is understood that some AEC experts feel the results indicate the boiling water concept reaches a point of diminishing returns in heat ratio as reactor size increases, and that the pressurized water type may therefore hold more potential for large-scale plants. But no final conclusion has been reached.

According to reports circulating both in and out of the AEC, the organic cooled design showed up best in terms of capital costs, but operating costs would be some .3 mills per kwhr higher than the pressurized water.

In addition to the reports discussed above, another design study by Nuclear Development Corp and Sargent & Lundy recommends construction of a 70,000-kw heavy water, natural uranium-fueled reactor. Figures on 200,000 and 400,000 kw versions, which could produce power at estimated costs of 11 and 9 mills/kwhr, respectively, also were offered.

Key committee Democrats are expected to push for inclusion of at least one, and probably two, of the reactors in next year's program beyond what AEC itself has asked.

The question of whether capital subsidies should be applied to commercial-scale, as well as prototype, reactors is now expected to come to a head.

McCone, who thinks construction grants should be limited to prototypes, may claim the study results prove his contention that private enterprise can build the big plants, when the time comes, without government help.

However, important Democrats on the committee are taking the view that the cost estimates still aren't low enough to attract private risk capital without government help—and that capital subsidies should be made available for one or more of the big reactors.

There is speculation in Washington that important segments of the utility industry will agree with the Democrats on this, particularly if some post-construction government aid can be arranged, too. If so, the Administration will have a hard time stopping an expanded reactor program from being voted.

NUCLEAR NOTES

Underground "method of taming the hydrogen bomb may succeed before the Project Sherwood" magnetic bottle approach does, said Dr Williard F. Libby, who recently resigned from AEC. Economical electrical power can result, be said, if practical ways are found to trap and make the steam.

Ceramic fuel element program has been launched by General Electric Co at Hanford Works. Ceramics can withstand up to 5,000F vs 1,500F top for elements using natural or enriched uranium.

Safety aspects on AEC-owned reactor projects will receive scrutiny of the public, under new AEC ruling. Procedures will parallel power reactor licensing procedures and will apply to Hallam, Neb., Elk River, Minn., and Piqua, Ohio plants in Power Demonstration Reactor Program.

Soviet 400-Mw A-plant turbine steam will be created within the reactor, permitting a 35% efficiency rate. Ordinary water, circulating at 723.3 psi, will "retard" reactions, according to Tass. The Ural district plant is first to do away with special steam-creating installations outside the reactor, Tass said.

Pioneers of Florida Power Saluted at Annual Meeting

The annual stockholder meeting of Florida Power Corp late last month had 199 specially honored guests. They are members of the company's Pioneer Club who were saluted by Pres W. J. Clapp, right, who told the 1,000 shareholders, "This company is people; people who shape the character of the company; people who are responsible for a million and one services rendered [for] other people—our customers."

In addition to a big display of photographs of company employees at work, a southern fried chicken box luncheon, a showing of a color "Power People" movie, and a Bartow Plant tour, the shareholders received these tidings:

Florida Power set new records in 1958, a year in which stock was split 3-for-1, dividends were increased 8%, and earnings rose 22% over 1957. Shareholders will have the opportunity to subscribe on a 1-to-12 basis for new stock offerings that will finance a $100-million construction program in the next three years, Clapp said.

New York PSC Orders Actual Taxes Be Used for Liberalized Depreciation

In a decision which may have far-reaching implications, New York's Public Service Commission ordered utilities using provisions of Section 167 of the 1954 Internal Revenue Code to use actual taxes for rate making and accounting.

The PSC also indicated that utilities not taking liberalized methods would be considered, for rate making purposes, as having taken advantage of these provisions.

New York thus follows Maine in concluding there is no deferral of taxes, so no normalization is needed since taxes are permanently reduced, and that prudent management will avail itself of all means to reduce operating expenses.

As for accelerated amortization, while the PSC permitted taxes to be normalized, a below-the-line Account No. 538—Miscellaneous "Income Deductions"—had to be used.

"We believe that each utility is under obligation to minimize its tax expense," the PSC noted. "We think that the selection of the method of depreciation for tax reporting purposes is peculiarly a managerial determination. Nevertheless, we have rate of return functions to discharge and for rate case purposes we will take note of, consider and be guided by the utility's actual practice . . ."

In discussing its findings on liberalized depreciation, the PSC said: "The effect of any tax benefits derived by any utility from the Section 167 provisions shall be reflected in the income tax account. No change in accounting systems or instructions is necessary . . .

"In rate matters the commission will as a matter of policy allow as a part of the cost of service the income taxes properly assignable to the operating income determined for rate case purposes, giving effect to liberalized depreciation tax deductions available to the utility under the tax code. The impact of taxes, paid by the utility in the first instance, is in reality borne by the taxpayer. It is the duty of the utility to ease that bureau to the extent that lawful compliance with the tax laws permit. This commission should encourage this tax saving and in future rate proceedings this element, intangible as it may be, will be given consideration.

"If utilities have been recording on books and in accounts entries not in conformance with the general policy, here stated, retroactive adjustments will not presently be required but may be made."

NEWS BRIEFS

New Jersey PUC has ordered that Public Service E&G can amend a petition for a $15-million gas rate increase to include a $21.4-million electric hike . . . Baltimore G&E has decided to appeal court order that called for partial refund and set aside, in part, PSC approval of a $4,422,000 overall rate increase.

REA released a $4,887,000 loan for a 230-kv line, highest voltage ever authorized by the agency, from Ft. Randall Dam, S. D., to Columbus, Neb. Nebraska Electric G&T Co-op, a new 22-co-op system, will build the 126-mi line.

Tacoma City Light is considering acquisition of Puget Sound P&L distribution facilities in a residential "tributary area" next to the city.

The Connecticut Light & Power Street Lighting Story

By aggressively promoting and selling street lighting, Connecticut Light & Power expects to reach $2 million in revenue by 1960

R. E. BALLARD, Asst Commercial Sales Manager, The Connecticut Light & Power Co

The better-than-average street lighting experience of The Connecticut Light & Power Co in the past several years is not due to any unique aspects of our service area. Rather, it is due to the fact that for some five or six years now we have taken a much more active role in promoting and selling street lighting.

From 1917, when the company was founded, until 1953 our street lighting revenue increased by an average of 3% a year. Since 1953, we have achieved better than a 10% annual increase in street lighting revenue. It took us 36 years to reach a million dollars in annual revenue, but since 1953 our street lighting revenue has increased by 65%. And with a continuing effort we expect to reach $2 million in annual revenue by the middle of 1960. Originally, we thought it would be 1961 but growth last year was so great that it is clear we will reach the two million mark by 1960.

Street lighting revenues have increased steadily for each year of the last five. Also over this period, percentage gains in street lighting revenues either topped those of all other classifications, or were very close to the top. For the 12 months of 1958, our street lighting revenues were up 16.2%, or $243,000, over the same period of 1957. (See chart, bottom of page 109). And what is probably the most significant measure of improvement—our lumen output multiplied almost 2½ times in just five years between 1952 and 1957.

Of course, some of this increase would have come anyway from natural growth but it would not by any means have been as great as it was if we did not have a well-planned and actively carried out program. We began this program in 1953. Before that time, we did little to actively promote street lighting sales. This was due partly to the lack of a uniform street lighting rate, and partly to a lack of personnel. In 1953, we were faced with a general rate change, and the time seemed propitious to introduce a uniform, more appropriate street lighting rate. We had already embarked on a program of converting from a series to a multiple system and a new one-part rate was necessary to reflect the correct charges.

A year later, the responsibilities of our commercial sales representatives were enlarged to include street lighting and we had, for the first time, local street lighting salesmen in every district.

This alone, however, would not have been enough for effective results. We were in business, but that didn't insure that business would be good. You've got to get both employees and civic officials interested in and enthusiastic about good street lighting; and you're not going to get your town officials enthusiastic about it if your own sales and other key employees aren't.

This applies especially to local district managers. As an instance of just what a manager can do when he can convince people of the value of better street lighting, there's a manager in our system who was asked by a wealthy lady for suggestions on what most needed doing from the point of general welfare activities in the town where she lived—a small rural town with no street lights. Our manager told her about the desirability of having at least some street lighting on the main roads of the town. She saw the light, and set up a $33,000 trust fund for the town, the income from which is used to pay for street lighting. As the surplus income builds up, it will pay for additional street lights.

Employee Interest Sought

It is important to reach many more employees besides managers with the good street lighting message, so we have used the employee's magazine. I think that the more employees, and customers too, are exposed to articles showing dramatic improvement in illumination, the more likely they are to be receptive.

To interest employees further in street lighting we create promotional stunts involving their participation. Three years ago we had a slogan contest with a first prize of $25. The employees were to submit a slogan that would, in four words, best describe good street lighting. The winning slogan: "Bright Street-Safe Street" now appears on all advertisements.

Last year an employee lead plan was instituted for the sale of street lighting to commercial establishments. For each lead reported which resulted in a sale, the employee received a check for $6.00. The lumen output of the unit was restricted to 21,000 mercury or the equivalent fluorescent. In 12 months we installed 150 luminaires.

In one town, the townspeople were so impressed with the greatly improved lighting that they decided to extend it from one end of the town to the other, becoming the first small town in the state to have continuous lighting from border to border.

In connection with employee interest, you must have a staff of company officers who are enthusiastic boosters of street lighting. It insures fine cooperation from the Operating, Purchasing and Engineering Departments in the vitally important respect of offering leadership and inducing high morale all the way down the line.

Once you've got your employees solidly and enthusiastically plugging better street lighting, you've got the vehicle you need to make progress. But you still have to convince town and city officials. In order to efficiently present a complete "better street lighting" program to the officials of several adjacent towns, we decided, in 1954, to try annual dinner meetings in each of our districts. These are not just CL&P affairs. We ask for and get invaluable assistance from the street lighting manufacturers in the preparation and presentation of our program.

In the latter part of each year, I get together with the street lighting manufacturers who are on our approval standards list to discuss and develop a program for the following year. The program is previewed by our district managers and district street lighting representatives so that they can suggest changes or improvements.

We then set up a schedule of meeting dates extending from March to June. Individual letters of invitation are sent by the district manager to all city and town officials in his district. Two days before the meeting, personal contact is made with all those who have not replied. At least 95% of those invited attend. Incidentally, if you plan to invite your town fathers don't fail to include members of the Finance Board.

The manufacturers' representatives are each allotted a maximum of 12 minutes for their presentation. Several full rehearsals are held beforehand to check timing and make script changes. Each manufacturer's rep-

(*Continued on page* 109)

Save $11.79 per Kva with 34.5-Kv Dis

Excellent service characteristics plus installed cost savings prompt Idaho Power to choose 34.5-kv for future distribution

D. L. ANDREWS, Distribution Studies Engineer, Idaho Power Co, Boise, Ida.

Ten years of experience have indicated to Idaho Power Co that using 34.5-kv for primary distribution saves at least $11.79 per installed distribution transformer kva over a similar 12.5-kv area.

Presently, about 270 miles of 34.5-kv line supply 42,000 connected kva of irrigation pumping and domestic load in 191 sq miles of Minidoka County. Savings are measured against a 12.5-kv installation in neighboring Cassia County.

Bulk of the savings is due to the fewer substations required and virtual omission of subtransmission. Also, the inherent lower losses of 34.5-kv distribution make further savings possible by (1) use of smaller conductor, or (2) providing greater load growth margin with the same size conductor.

The Minidoka County system has three 138-34.5-kv substations, totalling 50 Mva, feeding the area over seven radial feeders. Interconnection is possible between substations, using pole-top switches at feeder ends.

Each substation bus is regulated. Load transformers are connected phase-to-phase, with newer installations using 20-kv transformers connected wye-delta. Single-phase load is supplied by 20-kv transformers connected line to neutral. Extensive shunt capacitor installations on the primaries improve the large pumping-load power factor.

In preparation for expected 12.5 to 34.5-kv conversions, Idaho Power's new construction standards have been designed to make the two systems compatible, requiring only a change of insulators and equipment when converting a 7.2/12.5-kv line to 20/34.5-kv line.

Establishing such a far-reaching policy required definitive cost comparisons, so the two-county test was set up. Area characteristics, type of load served, age of plant, and load density of the systems are similar.

The areas chosen lie on opposite sides of the Snake River in Minidoka and Cassia Counties. Minidoka County has some 191 sq miles served by 269 pole-line mi of 34.5-kv primary distribution, fed by three substations totaling 50,000 kva capacity. In Cassia County, about 166 sq miles are served by 227 miles of 12.5-kv primary distribution, supplied by 17,500 kva of capacity in four substations.

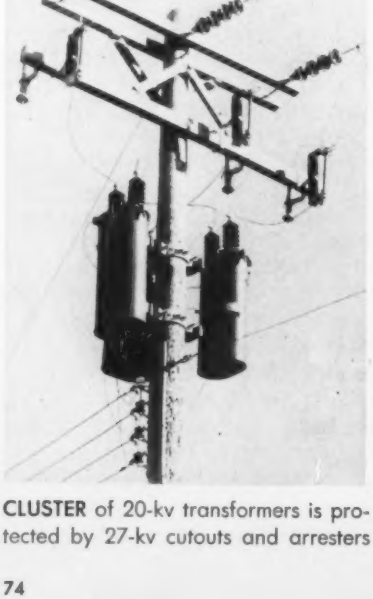
Irrigation pumping, developed largely in the last ten years, is the predominant load served in each county. However, almost half the services are to domestic customers, although they account for only about 1% of the connected kva.

Cost of the complete local electrical system to serve these areas was considered. Adjustments were made in distribution pole line miles, and in size of areas served, to account for the minor amount of 12.5-kv distribution.

The total capital investment for each area was divided into:

1. Transmission line (138 kv)
2. Subtransmission line (46 kv)
3. Substations
4. Distribution line (including meters and services)
5. Distribution transformers (including lightning arresters and protective cutouts)

The installed kva of distribution transformers was chosen as a base



CLUSTER of 20-kv transformers is protected by 27-kv cutouts and arresters

Table I—Investment as of Dec. 31, 1957

System Component	12.5-kv Primary Service Area	34.5-kv Primary Service Area
1. Transmission line (138 kv)		
6.0 mi	$103,092	
18.5 mi		$295,368
2. Subtransmission line (46 kv)		
47.0 mi	242,380	
3. Substations		
1—138–46 kv (25 Mva)	410,053	
4— 46–12.5 kv (17.5 Mva)	347,209	
3—138–34.5 kv (50 Mva)		1,020,329
4. Distribution line		
227 pole line mi	629,744	
269 pole line mi		874,251
5. Distribution transformers		
24,845 kva	338,180	
42,381 kva		842,425
Total capital investment for each area	$2,070,658	$3,032,373
Cost per kva of distribution transformer capacity	$\frac{\$2,070,658}{24,845}=\$83.34$	$\frac{\$3,032,373}{42,381}=\$71.55$

Distribution

for per-unit investment costs because it is a representative measure of actual load supplied and total kwhr delivered.

Table I, giving comparative costs of the two systems' component parts at 1957's end indicates 34.5-kv has an advantage of $11.79 per installed kva of distribution transformer capacity over 12.5-kv primary distribution.

In evaluating the study results, extent of local system loading should be mentioned. During the year the three 34.5-kv substations were about 75% loaded on summer peak while the four 12.5-kv substations were 98% loaded. Use of distribution transformer kva connected as the per-unit base for comparison thus makes results sensitive to substation loading. The system with the greater percent load will show lower per-unit cost.

Therefore, because the 12.5-kv substations are already nearly fully loaded, the future should bring a relatively lower per-unit cost for the 34.5-kv system as its load increases. This will mean a greater saving for the 34.5-kv system. Theoretically the largest possible difference in the cost of total local plant investment for the two test areas is $19.56 per kva of distribution transformer capacity, occurring if all components could be fully loaded in both areas.

This saving would occur only if the present sizes of distribution transformers were used. Transformers in the 34.5-kv distribution area average larger and are therefore cheaper per kva than if the smaller average size of the 12.5-kv area were used. The correction factor which would allow for equal size transformers in each area is $4.68 difference per kva transformer capacity, reducing the possible saving from $19.56 to $14.88 per kva.

Idaho Power's present concept of 20/34.5-kv construction is that of a "pure" distribution system. Accordingly, 8-ft standard 6-pin crossarms on 40-ft poles, with pole-top pins to carry the center phase wire, and the neutral 4 ft below the crossarm, have been adopted for tangent structures. Present deadends consist of four 6-in. disk insulators in series. Pin-type insulator standards are 100-kv, 60-cps dry flashover and 150-kv positive impulse flashover. A 1-in. pin-hole is required and a unipart insulator is desirable.

Earlier insulation coordination studies indicated that when 20/34.5-kv distribution is considered on the same basis as 7.2/12.5 kv and 14.4/25 kv, 125 BIL equipment might perform satisfactorily on a multigrounded system if protected by a 25-kv valve-type arrester. However, more conservative 150 BIL equipment is used.

SYSTEMS selected for cost comparison have same general characteristics, including load density and age of plant. Predominant load on both is irrigation

Table II—Total Cost Per Kva of Distribution Transformer Capacity

System Component	12.5-kv Primary Service Area	34.5-kv Primary Service Area
1. Transmission line (138 kv)	$4.15	$6.96
2. Subtransmission line (46 kv)	9.76	.....
3. Substations		
138–46 or 138–34.5 kv	16.50	24.08
46–12.5 kv	13.97	.....
4. Distribution line	25.35	20.63
5. Distribution transformers	13.61	19.88
Total Cost Per Kva of Distribution Transformer Capacity	$83.34	$71.55

Tests Check Lightning, Relaying Sp

Bureau of Reclamation's staged-fault tests probe poor lightning performance, and relaying and reclosing difficulties

JOHN O. GRIMM, Electrical Engineer, Commissioner's office, U.S. Bureau of Reclamation, Denver, Colo.

A lightning flashover rate much higher than expected, superimposed on usual relaying and reclosing difficulties of a long three-terminal line, characterized staged fault tests and prompted adjustments on a 230-kv Bureau of Reclamation connection in South Dakota.

The Fort Randall-Oahe-Watertown line is an important link in the bureau's far-flung Missouri River Basin transmission system. Only one side of the double-circuit construction is energized, yet this side is 270 circuit miles long.

When load and generation growth warrant, interconnections may be strengthened, and the line will be converted by use of the idle side to two two-terminal circuits, Fort Randall-Oahe and Oahe-Watertown. Meanwhile the three-terminal connection is preferred because it provides a better transmission pattern and better voltage control and requires less line-charging capacity.

Adapted from a paper presented at Illinois Institute of Technology 1958 Conference for Protective Relay Engineers.

Initial line design, based on normal lightning experience, did not seek extremes for providing high-speed tripping and relaying for all faults. Carrier relaying had been installed, but for the first season's operation it was not in service. Thus reclosing was not available.

Flashovers 11 or 12

Like several recent, similarly designed transmission lines, the Fort Randall-Oahe-Watertown line had more lightning flashovers during initial operation than expected. Based on experience with shielded 230-kv lines, one or two flashovers per year had been anticipated. Actually 11 or 12 occurred in the first year, 1956.

It is believed that these flashovers were due, in part, to the Watertown leg's particular design, which combines relatively long spans and high towers with single overhead ground-wire shielding.

Without high-speed relaying and reclosing, the flashovers resulted in line loss. This often initiated the breaking up of the interconnected system, especially as the heavy line charging required by the three-terminal line, combined with heavy loading of 115-kv tie lines, reduced system stability.

Relaying is made more difficult by line length and wide differences in system strength from terminal to terminal. These factors complicate fast relay pickup for remote terminal faults. Such faults require very sensitive settings, yet with adequate margins against pickup on load swings or unbalance.

Sensitivity Desired

Realizing these difficulties, bureau engineers decided to test and place all relaying and reclosing in service quickly and check actual performance by staged fault tests before the line's second lightning season in 1957.

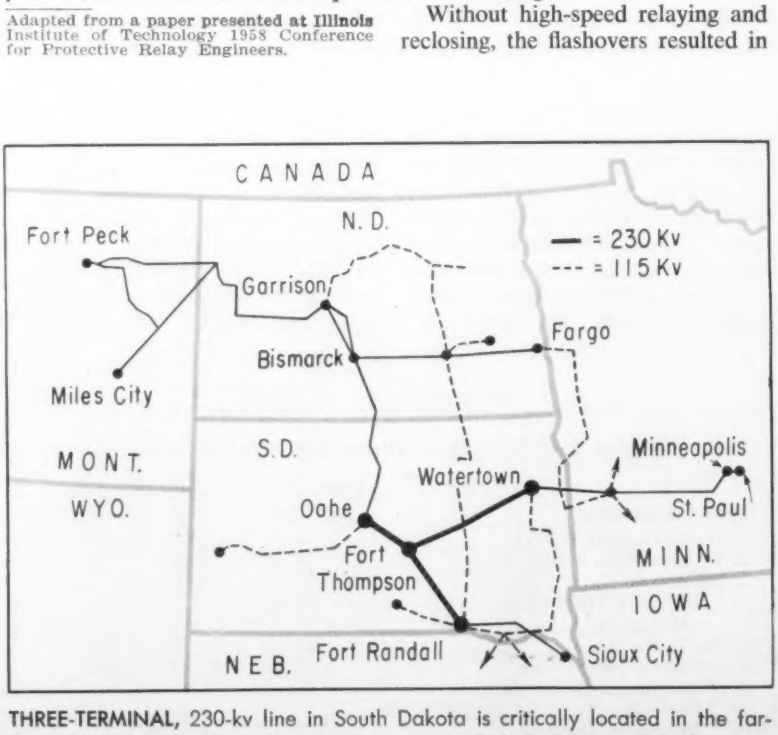
Line protection is standard in most respects, applying directional comparison carrier relaying. The HZM-3 and CEB directional carrier relays are used regularly by the bureau to provide additional back-up protection. The non-standard auxiliary current transformers, stepping up carrier ground relay current, provide relay pickup on very small initial ground fault currents.

The need for fast tripping and reclosing made extra sensitivity desirable. If instead of adding auxiliary CT's, line CT ratios had been reduced, some emergency loading conditions would cause excessive continuous current in CT secondaries and phase relays.

Fault Staged for Test

To test carrier relaying operation and fast reclosing under fault conditions, a series of staged fault tests were made under light load. Single-phase, line-to-line and line-to-ground faults were placed on the line at each of the three terminals. Flashover was simulated by a breaker, connected to the line and closed on a short circuit consisting of a fine iron wire.

Oscillograph records of each test at all three terminals included bus and line voltages, line, residual and polarizing currents, rectified car-



THREE-TERMINAL, 230-kv line in South Dakota is critically located in the far-flung Missouri River Basin transmission system of U. S. Bureau of Reclamation

Spur 230-Kv Line Adjustments

rier signal, and operation times of breaker trip coils, auxiliary tripping relays, and carrier start and stop relays. Records of carrier signal and start and stop relay operation were made only on the last day of the tests, when the need for them became apparent.

14 Tests Made

In all, 14 staged-fault tests were made. After thorough study of test oscillograms, the following steps were taken:

1. It was decided to retain 230-kv switching on the line at Watertown, rather than convert, per an original plan, to switching at 115 kv with an autotransformer made part of the line. This retained 3-cycle clearing time. Furthermore, the autotransformer would have contributed ground fault current after Watertown cleared, thus reducing the sequential ground relay operation margin at Oahe and Fort Randall.

Finally, all relay current and potential sources are separated from the line on breaker trip, allowing fast reset of phase relays by potential restraint torque and of ground relays by immediate cessation of ground fault current. This decreases the probability of false trip on spurious carrier transmission.

2. The reach of Fort Randall second-zone elements was increased about 10%, which is about the relay's maximum. This improves probability of pickup at Fort Randall on initial current to a Watertown phase fault. Any greater reach might produce false trip on power swings.

3. Reclosing time was increased to 25 cycles at Fort Randall and Oahe, and to 30 at Watertown, to increase probability of successful reclosing. As partial compensation for slower reclosing, two Fort Randall generators are dropped simultaneously with the three-terminal line at that plant. This slows acceleration of the remaining Fort Randall machines on three-terminal line faults and reduces their swing away from other major generation blocks.

When, as partial test, two generators were dropped with the line on one of the staged faults, system reaction seemed to be satisfactory.

Reclosing time at Watertown was made greater than that at the other terminals to eliminate or reduce the time overvoltages that might exist because of charging the line from Watertown alone. This increase helps prevent unnecessary operation of Watertown overvoltage relays. It also increases dead time for fault arc de-ionization for faults near Watertown, for which Watertown clears fast and other terminals more slowly.

Dead Time Varies

On test, one reclosure was successful after only 5 cycles dead time; another, however, was unsuccessful after 12½ cycles dead time, after correct operation of the relaying for a line-to-line fault at Oahe. In general, the staged faults probably required a longer dead time for de-ionization than the usual transitory faults because of reduced conductor-to-ground clearance, greater wind protection, and metallic vapor in the arc.

4. Ground backup relays at Oahe and Fort Randall were replaced with similar ones having instantaneous elements of lower range, the more sensitive settings making possible fast clearing of many ground faults independent of carrier.

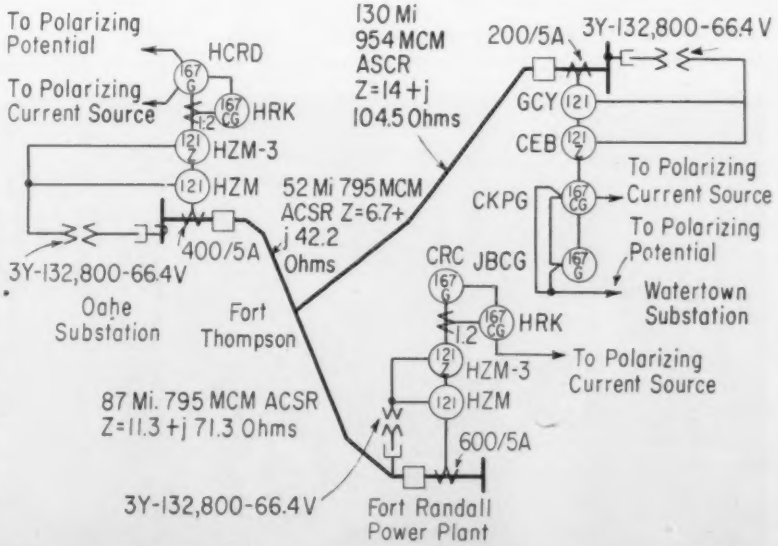
Performance of the Fort Randall-Oahe-Watertown line in the second year, 1957, was generally satisfactory. This was not only because of improved line relaying but because the interconnected system was more stable than in the first year.

The new Gavins Point power plant and switchyard had been brought into service, and a third 115-kv tie line with the Nebraska Public Power System had been energized. Many 115-kv relay settings were changed to reduce the probability of trip on power swings. These changes reduced the probability of system breakup for faults on the 230-kv three-terminal line.

One Line Locks Out

Of five line faults during the second season, three were attributed to lightning. Two were cleared and high-speed reclosed successfully at all terminals. On the third, the line relayed, reclosed, and relayed to lockout.

The bureau does not know why lightning flashovers were so much fewer in the second year, but lightning storms over the line were not quite as heavy as in 1956.



LINE RELAYING is mostly standard, applying directional comparison carrier relaying. Auxiliary CT's at Oahe, Fort Randall boost ground relay sensitivity

Unbalance Is Chief Vibration Cause in

Other vibration stimuli hit large steam turbine-generator and require correction

J. R. **LINDSEY**, Large Steam Turbine-Generator Department, General Electric Co, Schenectady

Mechanical unbalance, deviation of the centers of rotation and of mass from precise coincidence, though perhaps the most common, is not the only cause of vibration in large steam turbine-generator units. Unbalance can be caused temporarily by rotor bowing from uneven thermal conditions, or by small manufacturing irregularities. Bearing oil whip, excessive rotor flexibility, misalignment, and rotor dissymmetry are other causes.

The size and speed of today's giant powermakers magnify the difficulties of achieving balance. The rotating weight of some large turbine-generator units exceeds 100 tons; some bucket-tip peripheral speeds surpass that of atmospheric sound. Yet unbalance of only 2 to 4 oz in a critical place may produce vibration. Even when the greatest care is taken in manufacturing, residual unbalance may be present in a finished turbine or generator rotor.

Bucket Weights May Vary

Small residual unbalances can result from minute eccentricities in machining, slight irregularities in buckets or windings and/or small, permanent rotor bows. The larger turbine buckets may vary slightly in weight, even when made with identical forging and machining operations. To neutralize these differences, buckets are weighed and allotted compensating positions.

Rotors for 3,600-rpm turbines and for high-pressure sections of turbines operating at 1,800 rpm are machined completely from one large forging, the wheels and shaft being cut from the same piece of material. Buckets are positioned and installed before balancing. But forging limitations usually dictate built-up construction for the 1,800-rpm, low-pressure unit's rotor. The separately completed wheels are shrunk on the shaft, each being statically balanced after bucket assembly. Each wheel has material machined off until static balance has been achieved.

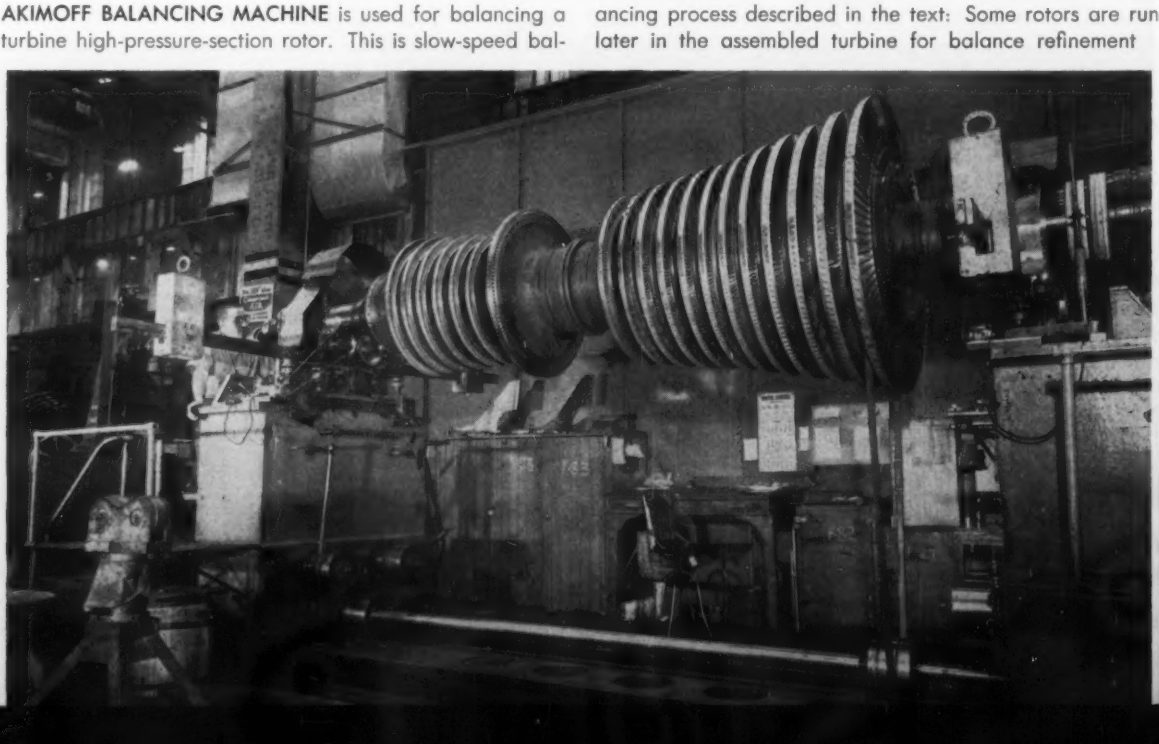
Mechanical unbalance is corrected by adding weights until the center of mass and the center of rotation coincide. Short, stiff rotors have weights added in only two axial planes; longer, more flexible ones in more than two. Completed turbine rotors are balanced first on slow-speed machines. Some may run later in the assembled turbine in the factory for final balance refinement. Generator rotors are balanced in a precision balance pit where there is access to their entire length for the addition of weights in nearly any axial plane. Rotors balanced carefully run successfully through and above their first, and even second critical speeds.

Adding weights eliminates unbalance in predictable circumstances, but does not preclude temporary unbalance at a particular speed, load, or time. Often temporary unbalance results from rubbing between shaft packing and the shaft itself. Rubs are most common on new machines with close clearances. After some operation of the unit, clearances tend to optimize, and further rubbing is unlikely.

But even slight rubs generate hot spots and, as the rotor itself bows toward such a hot spot, rubbing becomes more severe. As rotors running below the first critical speed are most susceptible to such temporary rubbing, the problem pertains usually to starting. Rubs are most common on 3,600-rpm units.

Uneven heat transfer from shrunk-on parts is a com-

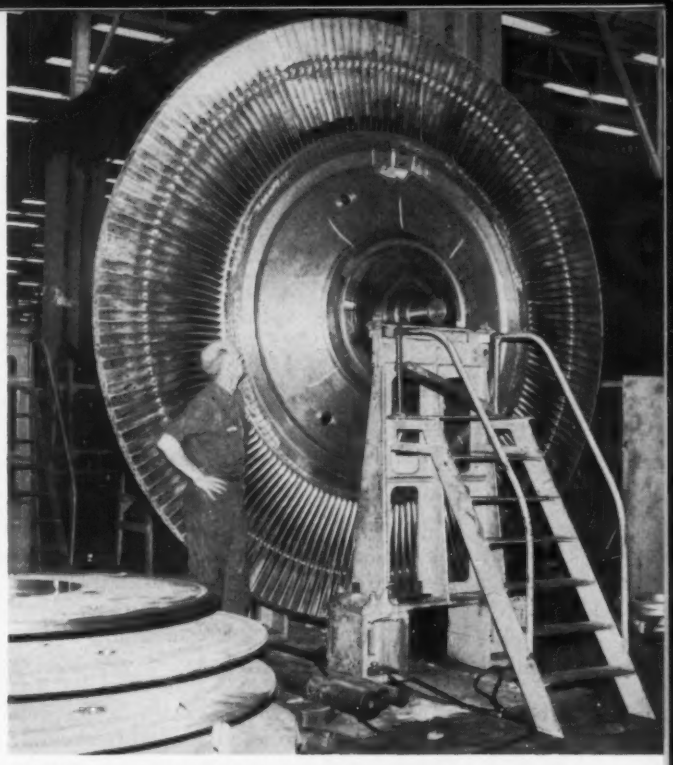
AKIMOFF BALANCING MACHINE is used for balancing a turbine high-pressure-section rotor. This is slow-speed balancing process described in the text: Some rotors are run later in the assembled turbine for balance refinement



in Large Units

mon cause of temporary unbalance. Problems of uneven heat transfer are most usual with 1,800-rpm units, whose large rotor masses have many shrunk-on parts. Improved assembly procedures and well designed fits have largely reduced these problems.

Accordingly, designers must consider how to expedite heat transfer among parts so as to minimize the time during which a transient temperature differential persists. Under steady-state conditions uneven heat transfer also arises at the surface between a shrunk-on water impeller and shaft. The latter is usually far hotter than the associated impeller which is in contact with water. Any dissymmetry of the contact surface between the parts, due to oxidation or lead compound produces uneven heat flow from shaft to impeller and consequent bowing of the shaft. This type of rotor bow is a function of the relative temperature differential between the two parts and, therefore, may vary with load and water seal temperature. As large changes in vibration accompany water seal temperature changes, such trouble is easily analyzed, and corrective action is straightforward. Today's turbines with steam seals do not pose this problem.



TURBINE BUCKET WHEEL is being balanced in the static wheel balancing machine. Each is treated individually

Lead Compound Abandoned

The use of lead compound in the assembly of shrunk-on parts to prevent galling has been reduced because of its association with heat transfer problems.

Improperly designed keyways between wheels and shafts on built-up rotors sometimes provide paths for steam leakage along the rotor under the wheel fit. This condition has brought serious rotor bowing as a function of load. But modern turbines have improved keyways in hot steam areas.

Differential expansion between shrunk-on parts and the shaft causes vibration due to the unbalance associated with rapid changes in load and steam temperature. Shrunk-on wheels, subjected to excessively rapid temperature rises, temporarily lose their "shrink" on the shaft and become unbalanced through a difference in mass position. This can be circumvented by "pin bushings" under the wheels, the bushing connected to the wheels by a series of radial pins on the periphery. When the wheel, heated too suddenly in operation, expands away from the "pin bushing," it is held centrally by the pins, and bushing remains tight on the shaft.

Water sometimes in the shaft bore brings a vibrational behavior associated with temporary bowing. On most rotors bore holes are sealed by plugs shrunk into both ends of the bore. Water entrapped here causes the shaft to bow as load and steam temperature rise. As the hole is not exactly concentric with the axis of rotation, most of the water is thrown to one side of it. The water boils when surrounding metal reaches saturation temperature and forms steam. The latent heat of evaporation, absorbed by the steam, cools the rotor on one side more than on the other; this produces a thermal bow. The steam migrates to the cool end of the rotor, condenses, and the process begins again.

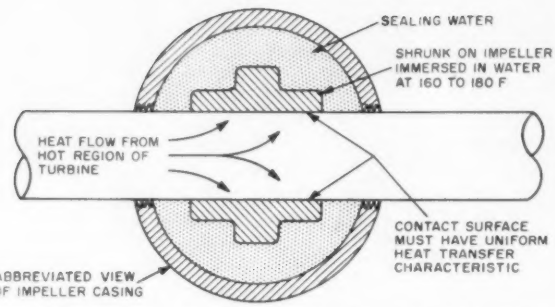
In today's manufacturing procedures, care is taken to clean bore holes of moisture thoroughly before they are sealed off. Carefully fitted plugs assure moisture-proof fits under conditions of thermal and centrifugal stress.

Tests show that a normal rotor, heated for the first time after machining, takes a definite bow and then straightens suddenly, or "breaks." This effect, it is believed, is due to non-uniform surface emissivity. As soon as temperature is high enough, a uniform oxide layer forms, establishing uniform surface emissivity. Rotor temperatures then equalize, and the rotor straightens and remains so.

Other causes of thermal instability are non-uniform coefficients of expansion and of thermal conductivity, both remediable by a complete reheat treatment at the steel mill. Rotors, receiving a permanent bow from residual stress during forging, are fully restored in this way. Unusually severe operational rubs can cause permanent stresses of this kind. The rotor must then go back to the manufacturer for more heat treatment and, perhaps, some remachining. But such rubs may be practically eliminated by good operational procedures in starting and loading.

When a hot turbine rotor is stopped, it bows rapidly because of uneven temperature conditions in the turbine casing due to the tendency of heat to rise. Stationary rotors bow upward, and such bowing may lead to rubbing and further difficulty unless the rotor is straightened before the unit is started.

Thermal bowing during shutdown can be prevented by liberal use of the turning gear. A rotor temporarily bowed during a turning gear shutdown can be straightened by several hours of turning gear operation. When machines are shut down suddenly from full-load conditions without use of the turning gear, bowing can be severe enough for internal damage to take place simul-


SEALING WATER
SHRUNK ON IMPELLER IMMERSED IN WATER AT 160 TO 180 F
HEAT FLOW FROM HOT REGION OF TURBINE
CONTACT SURFACE MUST HAVE UNIFORM HEAT TRANSFER CHARACTERISTIC
ABBREVIATED VIEW OF IMPELLER CASING

WATER IMPELLER is shown in schematic view, revealing how it is shrunk on a rotor shaft and then immersed in water

taneously with subsequent turning gear operation. Under extremely severe conditions of hot shutdown without the gear, it is better to stop the rotor for perhaps a half hour after rotating it 180 deg before establishing steady-state turning gear operation.

Another basic cause of turbine-generator vibration is bearing oil whip, an unstable oil action in the bearing which causes the shaft to rotate around the bearing clearance. The center of the shaft moves in a circular or elliptical path whose diameter approaches the bearing clearance. Oil whip frequency is often about half of the running speed frequency. When a bearing is loaded lightly for a particular journal speed and oil viscosity, the resulting thick oil film could sustain whip. Heavy bearing loading and light oil tend to suppress it.

Cylindrical rather than elliptical bearings are likely to develop oil whip. The latter have been developed largely for their whip-suppressing characteristics. They are machined by a circular cutting operation with temporary shims in the joint between the halves. Removal of the shims produces the elliptical shape with the major axis horizontal. Journal clearance in the horizontal about doubles that in the vertical direction. This non-uniform clearance creates horizontal joint discontinuities which break up any tendency of high-pressure regions of oil to circulate. The discontinuities relieve oil pressure near the horizontal joint and prevent lifting components of the oil pressure in this region from carrying load, which would cause light unit loading at the bottom of the bearing.

Anti-whip bearings have been developed for application where an additional margin of stability is needed. Among these are the axial-groove and the pivoted-shoe or tilting-pan types, both restraining the shaft with oil wedges which build up pressure around the journal.

Oil whip is usually signalized by a sharp increase in shaft vibration amplitudes at or near running speed frequency and is generally present in large amounts, or not at all. Normal shaft vibration amplitudes of 2 or 3 mils may increase suddenly to 10 or more mils at the onset of whip. Corrective measures include alignment changes, increases in bearing loading, changes in oil temperature and flow, and alterations in bearing type or design. When alignment is good, oil whip is unlikely. But incorrect alignment can sometimes cause bearing instability.

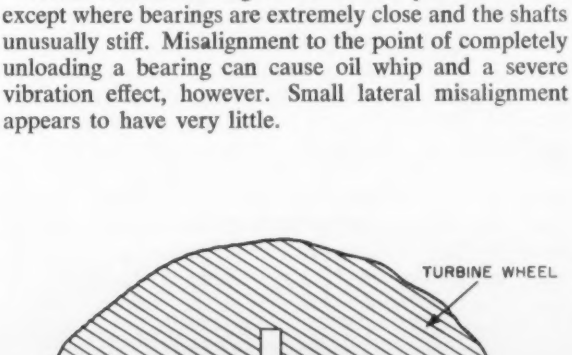
Excessive rotor flexibility and rotor dissymmetry cause vibration. Excessive flexibility can initiate large shaft vibrations when the rotor does not resist the build-up of vibrations due to small vibratory forces associated with steam, unbalances, and oil instability. Stiffness is sometimes reduced in a rotor plane by the slots cut in the forging for the windings. Such dissymmetry, coupled with the constant pull of gravity, causes a constantly changing sag in the revolving rotor. The result is vibration at double frequency.

Cross-slotting the pole faces gives uniform stiffness in all planes. The amount of cross-slotting is determined by experience and calculation and is verified by the amount of double-frequency vibration during running operation for balance purposes.

Designers minimize vibration by diminishing vibrational response to unbalance. They design components so that natural resonant frequencies differ as far as practicable from vibration stimulus frequencies. More unbalance or other vibration stimulus can then be tolerated without bringing objectionable vibration. Designers usually calculate multiple-span, critical speeds for most modern turbine-generator units. New designs are modified to keep calculated critical speed far removed from running speed. This requires considerable design effort on machines with several rotors, some having different natural frequencies in the running speed range.

The effect of alignment on machine vibration may not be as great as many believe. Rotor misalignment produces no vibratory forces of its own, but only distorts or magnifies vibrations induced by other forces. A change in elevation of a bearing, tending to load it heavier, might cause additional vibration of the bearing, yet misalignment wouldn't be chief contributor.

Small vertical misalignment is usually not harmful, except where bearings are extremely close and the shafts unusually stiff. Misalignment to the point of completely unloading a bearing can cause oil whip and a severe vibration effect, however. Small lateral misalignment appears to have very little.



PIN BUSHINGS between the bucket wheel and the turbine shaft have their use on rotors of the built-up sizes

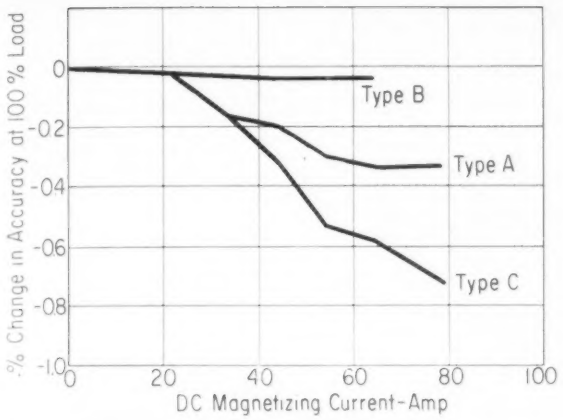


FIG 1—**METER STANDARDS ACCURACIES** decrease as result of excessive dc magnetizing currents because of a short

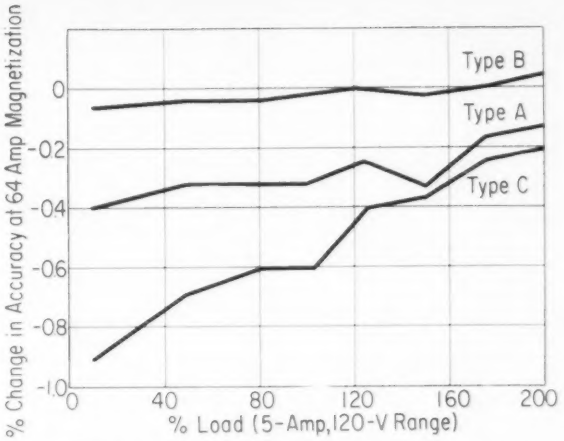


FIG 2—**MAGNETIZING CURRENT,** amounting to 64 amp, alters accuracies of watthour meter standards as charted

Tests Show Why Standards Err

Study of rotating units for testing watthour meters reveals to Detroit Edison effects of residual magnetism on accuracy

W. A. **GREIG,** Engineer and Assistant Standards Laboratory Supervisor, Detroit Edison Co, Detroit, Mich.

Residual magnetism causes errors in the rotating standards for testing watthour meters. This was the conclusion of Detroit Edison Co on the basis of recent tests. That residual magnetism of the current coil affects the standard's accuracy was suspected when accuracy changed about 0.5% after a short circuit blew the meter's fuse.

Routine demagnetization during periodical laboratory tests is the only company step taken to date to eliminate this source of error. Yet Detroit Edison believes that it may be able to minimize the effects of residual magnetism through use of a quick-blow fuse.

Following first indications of this phenomenon, the company deliberately blew several 2-amp fuses through a 1-amp coil. These fuse ruptures, it was noted, produced further erratic deviations in accuracy. The investigation continued.

Tests were made to determine the relationship between change in accuracy and magnetizing current on three types of standards. Three standards, one of each type, were connected in series and magnetized by several values of current from a storage battery. After application of each value of magnetizing current, the standards were tested and then demagnetized by an ac current at a peak value equal to the magnetizing current. The ac current was slowly reduced to zero.

In tests on the standards after each demagnetization, accuracy in the normal or demagnetized state was found to be stable. These tests were performed in the 5-amp, 120-v range. But accuracy varied as much as 0.7% between the standards measured in the demagnetized and in the magnetized state.

An accuracy curve was then established for the demagnetized standards for loads from 10 to 200% of the current rating. Load curves were prepared again for the standards magnetized with a 64-amp current. Maximum possible errors at light loads were probably not obtained, as the 100% load point was taken before the lighter loads, and some demagnetization is known to occur at rated current.

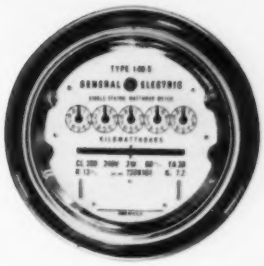
In a third set of tests, 2-amp fuses were blown through the 1-amp coil of the Type C standard. Changes in accuracy at 10 and 100% load on the 5-amp, 120-v range were measured. The fuses were blown on direct short circuit, as well as with a 6-ohm limiting resistor. Dc line voltage was used in order to eliminate variations in rupturing current, such as would occur on ac. Maximum effect obtained, 0.6%, corresponds to a 65-amp magnetizing current on the 5-amp coil. It was concluded that the 2-amp fuse blew at 13 amp on the 1-amp coil.

These tests established that residual magnetism causes errors in rotating standards. Further tests were made on standards returned from field use for periodical laboratory inspection and testing. The "incoming" accuracy at 100% load was recorded for each. The standard was then demagnetized by a maximum demagnetizing current of 35 amp ac on the 5-amp coil and tested at 100% load. Changes in accuracy up to .035% were noted.

The effects on Type B standards were negligible, but larger on Type C standards. What is significant is that "incoming" accuracies after demagnetization were in better agreement with the preceding "outgoing" accuracies than they had been ever heretofore.

Then, too, maximum effects are not observable in the laboratory, as normal use of a standard slowly effects some demagnetization, especially at overloads. A standard accidently magnetized may be demagnetized by blowing of a fuse on the opposite polarity.

Look behind the cover before you make the meter buying decision



Only General Electric's "Floating Disk" Offers

- *LIFETIME BEARING SYSTEM*
- *GREATER SUSTAINED ACCURACY*
- *NEGLIGIBLE TILT ERROR*

Superficially, all watthour meters look alike. But, if you look behind the covers, you'll see that the General Electric meter—with magnetic suspension—offers important, extra benefits.

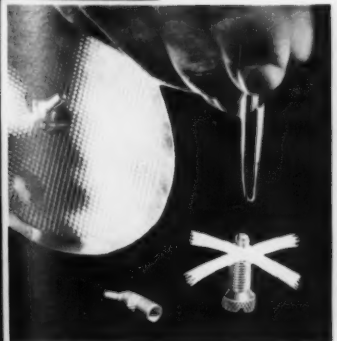
When comparing meters, either single-phase or polyphase, consider these factors before you make the buying decision.

MAGNETIC SUSPENSION OFFERS LIFETIME BEARING SYSTEM—There are over nine million General Electric magnetic suspension meters in service today. Not one of these "free-floating" systems has ever been replaced because of wear. This remarkable record is your assurance of freedom from costly inspection-and-replacement routines normally required to maintain old-style, ball-bearing systems.

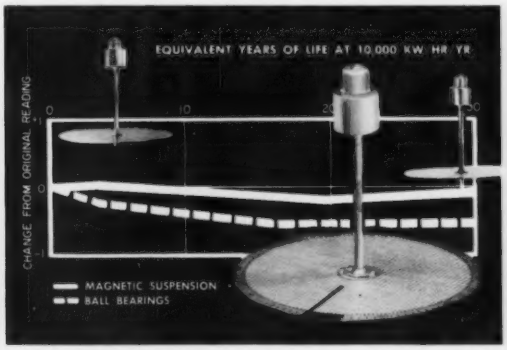
MAGNETIC SUSPENSION PROVIDES GREATER SUSTAINED ACCURACY—New test data prove that only General Electric "floating-disk" meters can provide the sustained accuracy to measure your customers' ever-increasing loads. Accelerated life tests at 300,000 kw-hrs (equivalent to 30 years' operation at 10,000 kilowatt-hours per year) bear out the fact that magnetic suspension meters offer greater sustained accuracy.

MAGNETIC SUSPENSION MINIMIZES TILT ERROR—The free-floating magnetic suspension disk in G-E meters is not subject to the same added friction which tilt imposes on ball-bearing systems. In addition, revenue losses from tilt-error are further reduced because abnormal changes in the position of the disk relative to the stator are minimized.

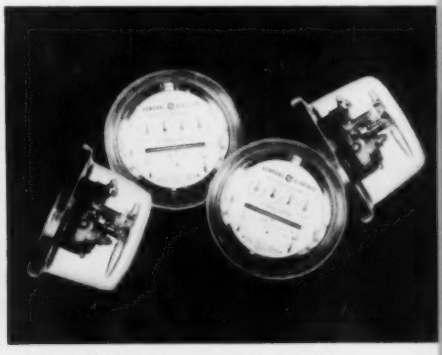
Your NEAREST G-E APPARATUS SALESMAN will be happy to give you more reasons why you should *look behind the cover before you make the meter buying decision.* For free literature on G.E.'s magnetic suspension meter line, write Section 628-27, General Electric Co., Schenectady 5, N. Y.



YOU SAVE on inspection-replacement costs; G-E "free-floating" meters require no ball bearings.



YOU REDUCE in-service testing expense because G-E meters with magnetic suspension assure greater sustained accuracy over a longer period of time.



YOU MINIMIZE revenue losses because G.E.'s "free-floating" suspension reduces errors caused by tilt.

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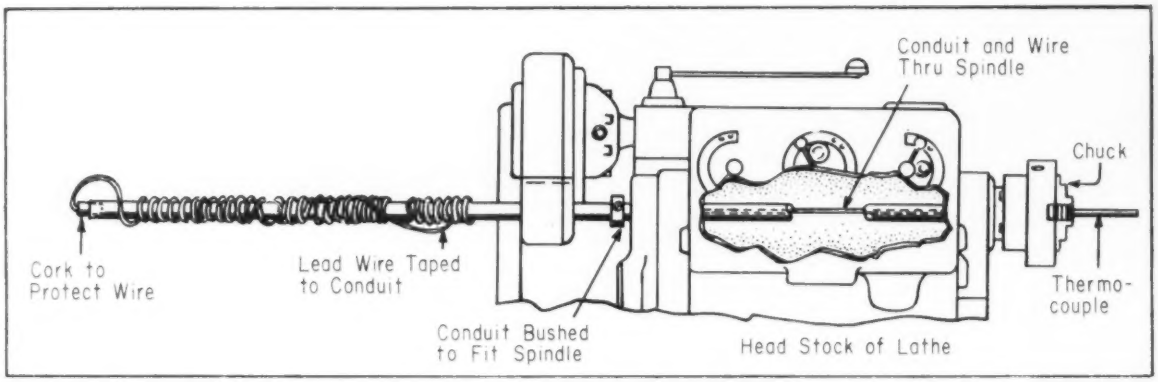
GENERAL ELECTRIC



Machine Parts With Leads Attached

A. J. SCHENK, Machinist, Philo Plant, Ohio Power Co, Philo, Ohio.

Machining small parts with leads attached has been simplified for Ohio Power Co personnel by mounting a conduit section in the lathe. By running the leads through the conduit while the conduit revolves in the headstock, the parts can be machined without damaging or tangling their lead wires.

A piece of conduit 74 in. long is bushed to fit solidly inside the hollow spindle of an engine-lathe headstock so it can turn with the spindle. Once the leads have been strung through the lathe spindle and conduit, the part to be machined is clamped in the lathe chuck.

The lead wire extending from the other end of the conduit is inserted through a hole in a cork which is plugged into the end of the conduit. Any remaining length of wire can then be coiled around the conduit and the ends taped in place.

Pumping Truck Empties Manholes

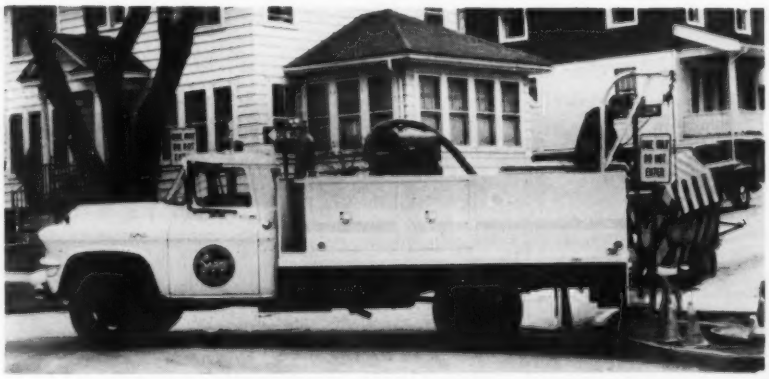
FRANK C. MARSCHNER, General Superintendent of Underground Lines, Detroit Edison Co, Detroit, Mich.

Pulling and splicing crews on the Detroit Edison Co system lose less time due to water and debris in manholes because of the speed with which a new 40,000-gal/hr pumping truck empties and cleans manholes. The new truck can pump out a manhole in a matter of minutes. Limiting factor is the speed with which sewers will take the water.

The unit consists of:

1. A permanently mounted 4-in. centrifugal pump.

2. A self-dumping mud hopper to carry dirt and sludge removed from manholes.



3. Two 50-gal pressurized water tanks and adequate piping for flushing manholes. Pressure on the water tanks is maintained at 25 psig by means of a 220-cu-ft nitrogen tank.

4. A bin to hold scrap cable and other salvageable material.

standardizes itself continuously . . .

This new General Electric Type HF recorder is continuously self-standardized. And it's typical of the new G-E null-balance strip-chart line. No more batteries, standard cells and standardizing mechanisms . . . new silicon diode voltage source now makes possible completely uninterrupted measurement and control—with measurement accuracy of ± ¼ percent. ***Unitized plug-in construction*** provides simple design with isolation of components by function. All major components are mounted on swing-out mechanism panel for easy servicing outside case. Both single-pen Type HF and two-pen Type HL are available. Or, for an intermittent record of up to 20 different signals, G.E.'s new Type HG multi-point recorder prints as fast as 1.2 seconds per point. All types measure ***wide range of parameters . . .*** pen speeds from 1 to 24 seconds, chart speeds from 1″/hr to 360″/hr, plus many other optional accessories and a variety of control forms. Get the complete story about these and many other outstanding features. Just call your nearby G-E Apparatus Sales Engineer, or write for bulletin GEA-6887, Section 595-102, General Electric Company, Schenectady, N. Y.

Other Instrument Department Recorders for Electric Utilities— *Inking and inkless; portable and switchboard; duplex and twin; hook-on recording volt-ammeters. Photoelectrics, oscillographs and vibrometers.*

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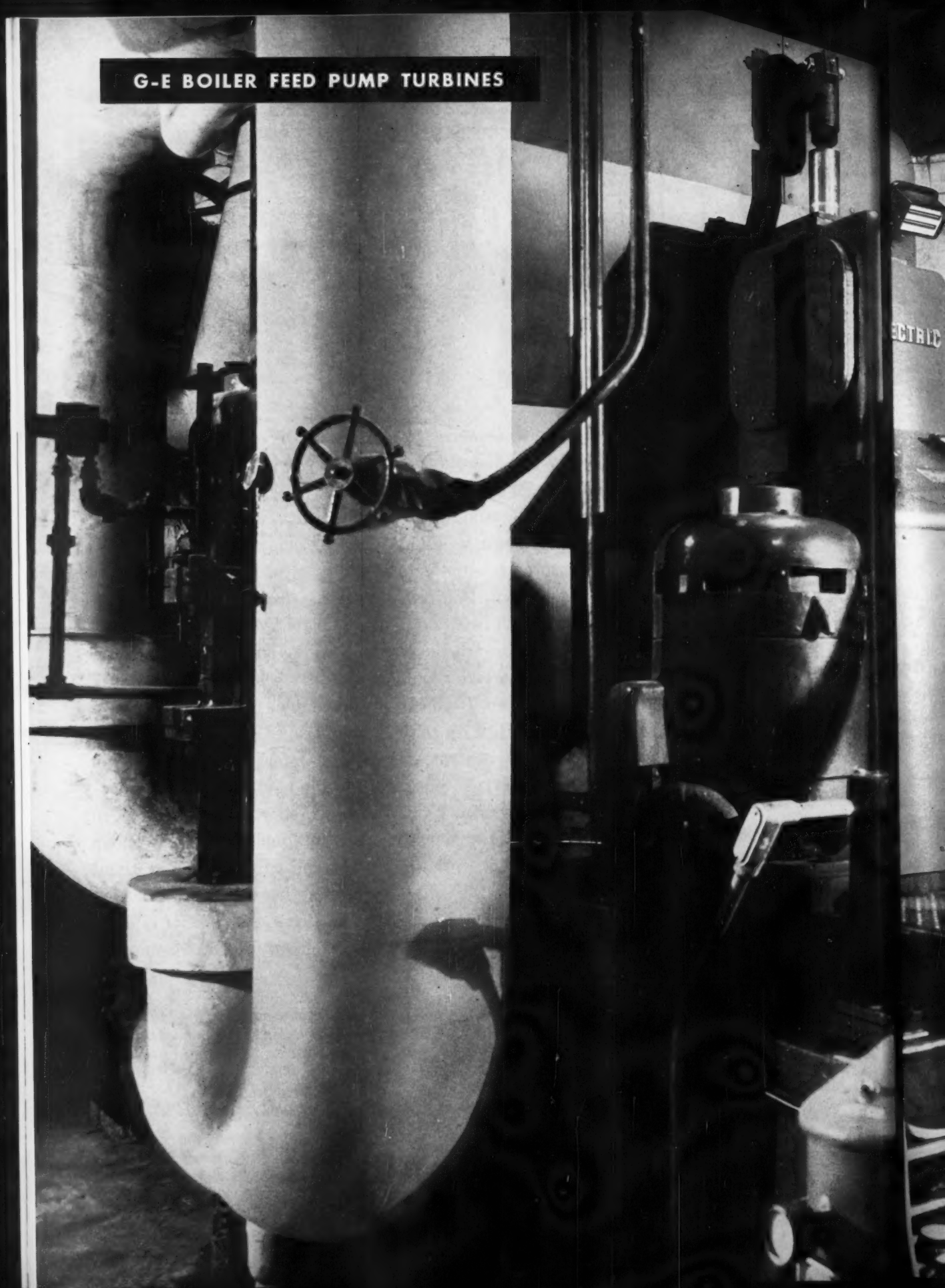

G-E BOILER FEED PUMP TURBINES

Boiler Feed Pump Turbines
Help Utilities Achieve . . .

PROFITABLE POWER

29 General Electric units installed and ordered give evidence of wide utility acceptance

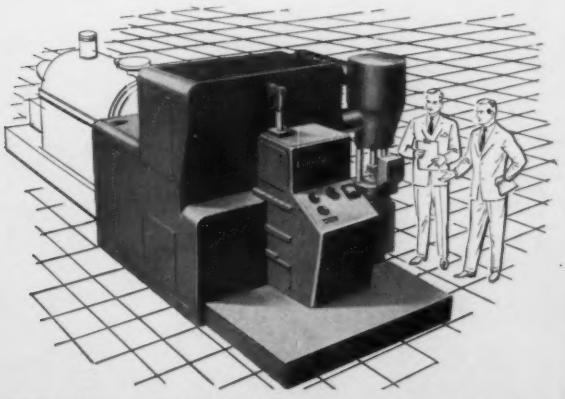
In less than four years, 13 electric utilities have ordered 29 General Electric boiler feed pump turbines to supply feed water requirements for a total of 7,413,000 kilowatts of generating capacity. Ten of these compact units are currently in operation providing utilities with more saleable kilowatts.

Pictured here is a General Electric boiler feed pump turbine which supplies feed water for Unit No. 67 at Niagara Mohawk Power Corporation's Huntley Station. To facilitate piping, the turbine is located at grade level directly below the main unit.

Why the growing acceptance? Continuing trends to greater capacity and higher pressure in large steam-electric generating stations have created demands for boiler feed pump turbines to improve efficiency and reliability at higher pump operating speeds. Economic gains are also realized because turbine drives for boiler feed pumps release auxiliary power to increase net saleable station output.

Extensive application experience in diverse utility operations is your assurance that General Electric is prepared to engineer, manufacture, install, and place in operation boiler feed pump turbines that fit your particular operating requirements.

For more information on how you can benefit by using General Electric boiler feed pump turbines, contact your nearest Apparatus Sales Office, or write for Bulletin GEA-6541, General Electric, Schenectady 5, New York.



TYPICAL General Electric boiler feed pump turbine designed to provide electric utilities with more profitable power.

Progress Is Our Most Important Product

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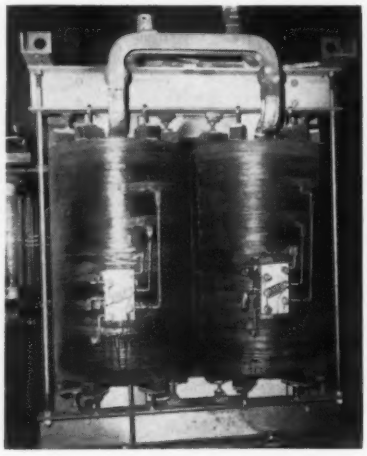
241-13

New Insulation Withstands Extreme Current

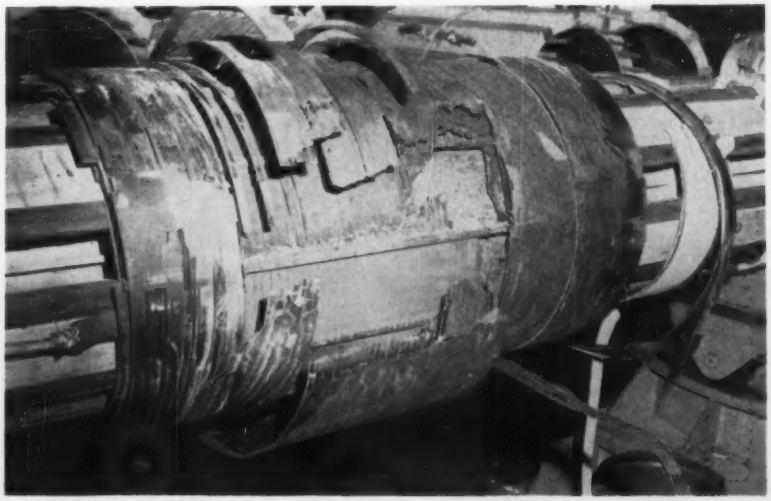
G. F. **SIMMONS**, Medium Transformer Dept, General Electric Co, Rome, Georgia

Few manufacturers of heavy industrial equipment have the opportunity to test their products to destruction to determine the amount of protection each individual component offers. Recently, however, the opportunity was provided to determine first-hand the effectiveness of a new inorganic insulation system developed for sealed dry-type transformers. The insulation, called Alpholite and consisting of formed asbestos and aluminum phosphate had, of course, received all standard laboratory tests and was fully certificated for normal usage as the basic insulation structure of the sealed dry-type transformer. But the ultimate capabilities of the insulation were not learned until a recent event dramatically demonstrated them.



UNTANKED CORE AND COIL appears externally just as it did when placed in sealed tank five years before

RIGID BARRIER of asbestos and aluminum phosphate is intact except for area eroded in extreme (1,083C) heat



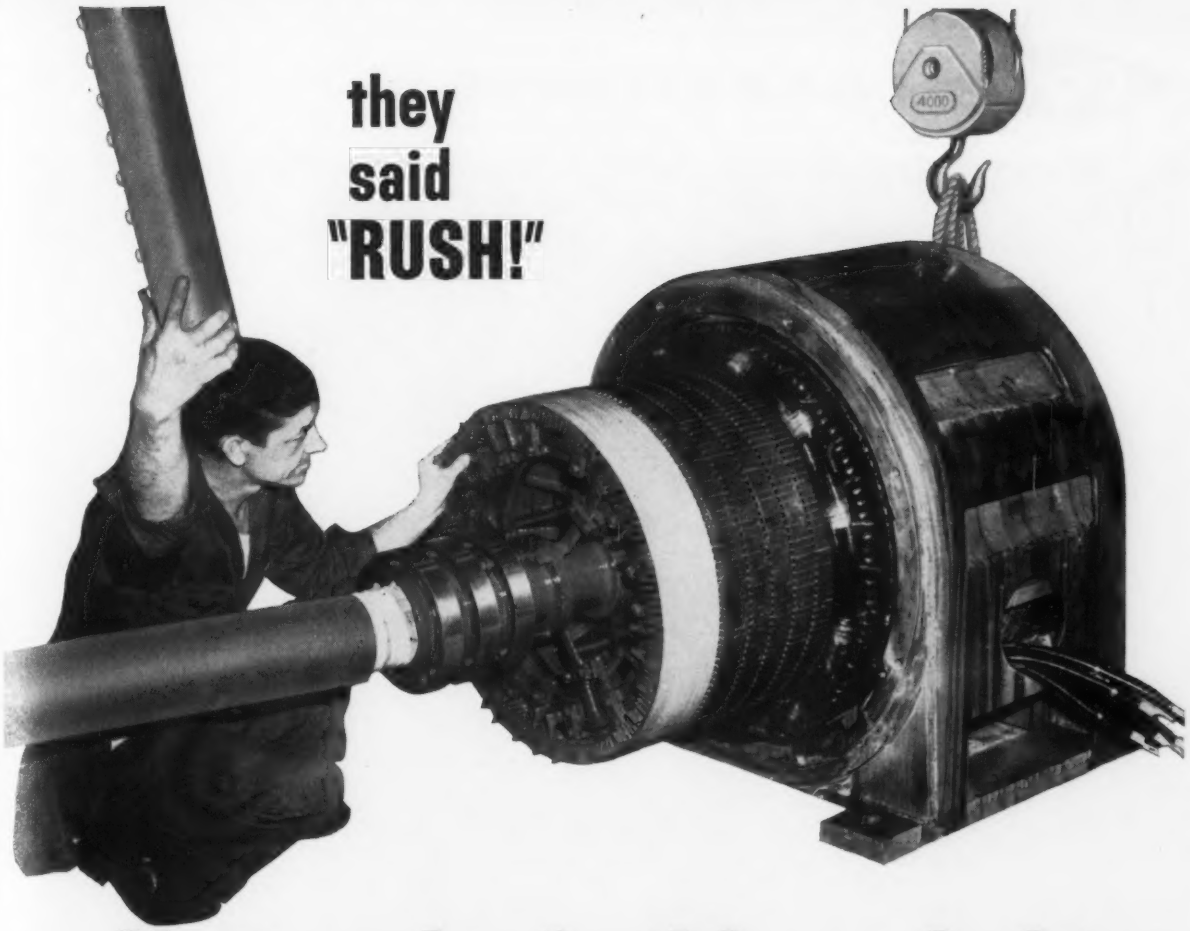
EXPOSED HV WINDING shows that conductor melted and flowed through cooling duct. Barrier and duct spacers between layers of HV winding are visible

An installed and operating sealed dry-type transformer, incorporating cylinders, end-rings, and duct-spacers of the new material was recently exposed to an unusual condition that resulted in extremely high currents through the transformer conductors. Under "normal" short circuit conditions, an instantaneous high current is impressed on the high voltage breaker and is normally accompanied by an immediate breaker trip. The time element of the current surge is short enough to prevent appreciable tank pressure increase.

In this case, a final tank pressure of 15 psig was observed after the failure. From this it was concluded that the transformer winding had been subjected to a gradually increasing overload, thereby permitting excessive heating without causing the primary circuit to be interrupted. The high-voltage coils became so hot the copper melted on the inner layer of the winding. (Melting point of copper is about 1083C).

Because of the construction of the sealed dry-type transformer, there was no resultant explosion or fire and no visual damage to the tank or to the core and coil structure. However, when the transformer was dismantled, the full impact of what had happened was brought to light and is shown in the accompanying pictures.

Despite the high temperatures attained in the inner layers of the high voltage winding, the Alpholite barrier separating the high voltage winding and low voltage winding remained completely intact. Consequently the low voltage circuits connected to motors and other utilization equipment were completely protected from the dangerously high voltage both during and after the transformer windings were destroyed. Had it not been for this protection, extensive and costly damage could have been caused to all of the low voltage equipment served by the transformer.



so National rebuilds and ships motor in 4½ days

FAILURE of this slip-ring induction motor threatened a shutdown of service. So the owner shipped the motor to National Electric Coil – to get it rebuilt fast and rebuilt right.

In just 4½ working days, here's what National did: *designed* and built both stator and rotor coils, rebabbitted the bearings, turned the slip rings, repaired stator laminations, rewound stator and rotor, dynamically balanced the rotor, performed complete checkout testing, crated, loaded and started the motor on its return trip!

For service when you need it, it's wise to have this responsible, competent organization on your electrical machinery team. Call or write for full information.

McGRAW EDISON

National Electric Coil

DIVISION OF McGRAW-EDISON COMPANY
COLUMBUS 16, OHIO

ELECTRICAL ENGINEERS • MANUFACTURERS OF ELECTRICAL COILS, INSULATION, LIFTING MAGNETS • REDESIGNING AND REPAIRING OF ROTATING ELECTRICAL MACHINES

DOW | HERBICIDES

NOW—trained Dow field men

The man in the business suit is a transmission engineer who had a hunch he wasn't getting his money's worth from chemical vegetation control. He called his Dow field service man to take a close look.

On-the-spot inspection was just in time. What had looked like a thorough vegetation control job last fall was showing shortcomings with the full flush of growth. The wrong choice of material had failed to finish off a troublesome stand of oak. Stumps not properly treated were beginning to re-sprout. Places that should have needed only a touch-up spraying this year now needed a full treatment *—with the right formulation.*

When he finished his examination, the specialist from Dow had plenty of profitable advice to offer. He showed which application method to use . . . prescribed the correct dosage and timing for application of Veon*, Esteron*, 245 O.S., and Kuron*. The result: this utility will save real money from this season on . . . and get better vegetation control than ever before.

Right now is the time to re-evaluate your vegetation control program. A trained field service man will gladly accompany you or your spraying contractor on an inspection trip. A quick way to invite him is to clip the coupon at the right.

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help you plan and save

. . . with Dow Brush and Weed Killers

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I'd like a summer check-up of my vegetation control program.

☐ Please have a vegetation control expert call.

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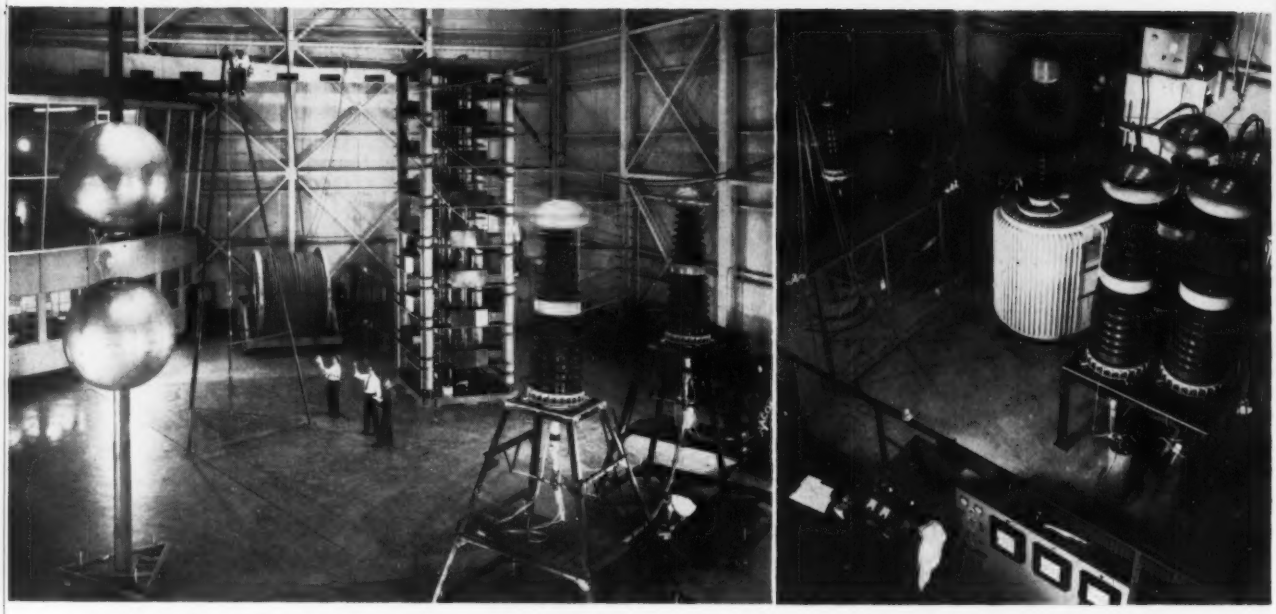
THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN

Manufacturers News



EHV cable research lab viewed toward observation and control gallery; 750-kv transformer set and instrument panel

Anaconda Wire & Cable Opens 345-Kv Lab

Anaconda Wire & Cable Co officially opens this week its extra-high-voltage laboratory at Hastings-on-Hudson, N. Y. It is designed for research, development and testing of conductor cable up to 345 kv.

The lab is equipped with a 3-million-volt impulse generator, 200-cm sphere gap, 345-kv cable, terminals, and other devices for 60-cyc high-voltage and impulse tests.

L. F. Hickernell, vice president of engineering and research, will preside at opening ceremonies. He is also president of AIEE.

Westinghouse Sees Rise in Orders

Moderate gains during 1959 in new orders "in practically all of our product line groups" were forecast at the Westinghouse annual meeting by President Mark W. Cresap, Jr. He told stockholders meeting in the company's new distribution transformer plant in Athens, Ga., that billings will remain about the same as for 1958, with possibly slight advances.

Cresap said that anticipated orders will top billings this year because some orders for heavy utility and industrial apparatus will not be delivered during 1959. On the other hand, consumer products and lighter utility equipment will bolster sales billed.

Cresap emphasized that cost-control programs put into effect in 1958 have contributed to earning ability already. However, the company did not cut back on research, product improvement and promotion projects. In fact, 1958 expenditures for research and development were the highest in the company's history, $190 million ($140 million of it on engineering work for specific customers; $35 million on standard product lines; and $15 million for fundamental research and long-range product development).

GE to Rent Instruments

General Electric has made available for rental its pool of 13,000 instruments for 70 kinds of measurement. They may be secured for emergency testing jobs or as supplemental laboratory equipment from the company's 55 service shops. Most rentals, GE estimates, will range from $1 to $96, averaging about $16.

Requirements of GE's internal rental program. for which these instruments were formerly used exclusively, indicate that most rentals will involve such instruments as voltmeters, ammeters, wattmeters.

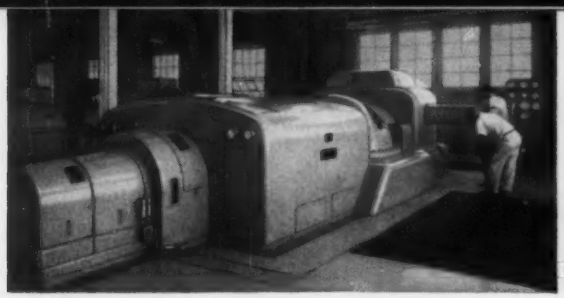
Alcoa to Publish Conductor Data

Data on several conductor research projects conducted by and for Aluminum Co of America is being compiled into a series of booklets, "Alcoa Aluminum Overhead Conductor Engineering Data," by the company. The first section will be released shortly, and the entire compilation of previously unpublished material will be available to the electrical industry within a year.

(*More Manufacturers News, p* 94)

One reason why Fairfield, Illinois has efficient electric service—

Nonpareil Turbine Oil



Plant superintendent James Easton and Standard Oil industrial lubrication specialist Charlie Brown inspect 5,000 kw. Worthington turbine, one of four turbines in Fairfield Municipal Light & Power Company plant lubricated with NONPAREIL Turbine Oil.

These turbine installations trace the record of growth in electric power consumption in Fairfield, Illinois, over the past 19 years:

Type	Turbine Cap.	Installed
Westinghouse	1,500 kw.	March, 1940
Westinghouse	2,500 kw.	March, 1942
Westinghouse	4,000 kw.	March, 1949
Worthington	5,000 kw.	July, 1957

When the first turbine went into service, Fairfield Power plant management decided upon a turbine lubricant they felt would be dependable—NONPAREIL Turbine Oil. Standard Oil, they found, would give them concrete evidence of the oil's dependability. They received a certificate guaranteeing that, for the life of the turbine, the acidity of the oil would never exceed 0.15 mg. KOH/g. Indeed, through the years the oil has remained at a much lower acidity level, usually in the order of 0.06 mg. KOH/g. Periodic analysis of the oil in Standard's Whiting laboratory confirms that the oil is performing according to guarantee.

The kind of service Fairfield Municipal Light & Power gets from NONPAREIL Turbine Oil comes about this way: NONPAREIL is the subject of special refining techniques and handling. A special crude is used as a base stock. All sludge-forming compounds are removed. An oxidation inhibitor which permanently controls acidity is added. No sweetening or resting of NONPAREIL Turbine Oil is required at any time.

Men with experience in turbine lubrication can give you more facts about NONPAREIL Turbine Oil. Call your nearby Standard Oil office in any of the 15 Midwest and Rocky Mountain states. Or write **Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.**

You expect more from **STANDARD** *and you get it!*

Standard's Charlie Brown, here with Easton, supervised installation of NONPAREIL Turbine Oil in Worthington turbine. His experience and training qualify him for such work. Charlie received science training and graduated from Eastern Illinois State College. He has nine years' service with Standard Oil and has completed Standard's Sales Engineering School.

CALL ON

KOPPERS

for rail or truck deliveries of POLES and CROSSARMS from plants and delivery yards

OFFICES IN PRINCIPAL CITIES

WOOD PRESERVING DIVISION
KOPPERS COMPANY, INC.
Pittsburgh 19, Pennsylvania

Germans Display Power Equipment

The Leipzig Fair in East Germany last month featured very little power equipment above the 220-kv range. It was also notable for the lack of displays by American manufacturers and the predominance of West German showings.

Some of the heavier equipment displayed included a 220-kv, 1250-amp,7500-Mva, gas-blast circuit breaker made by a major East German company (left in photograph). Also exhibited were 380-kv switchgear insulators of the outdoor fog type. They were solid type, with wet flashover voltage of 975 kv for 44,000 lb maximum tension.

EW's correspondent in Bonn says, "The East Germans are heavily overshadowed by their West German counterparts. But West German manufacturers take them very seriously, and representatives of Siemens and AEG (West German firms) would not even comment on the East Germans, saying this was 'competition' and they don't evaluate competitors."

(*More Manufacturers News, p* 99)

Are you wasting all kinds of time selecting the right wire and cable for your job?

MEET THE MAN

WHO CAN HELP YOU...

. . . on page 122

Sub-Station Man's Best Friend . . . VICTOR Apparatus Insulators

No. 729 (EEI-NEMA 58-7)
Apparatus Insulator

When power demands require switching . . . when rain, snow or sleet increase danger of current leakage and flashover, the sub-station super can feel a lot more comfortable if VICTOR Switch and Bus Insulators are standard on his installation.

Their design has been proven in thousands of installations. The most rigid quality control gives the power man insulators of absolute uniformity. Conscientious testing procedures with the industry's most modern testing equipment assure exceptional reliability under the most extreme conditions.

VICTOR stacking units, such as the No. 729 shown above, have been proved by some of the nation's foremost utilities to be able to undergo more severe service over a longer period than any other switch insulators on the market today!

NOT A THING TO WORRY ABOUT

No matter what your particular conditions of service, you can be sure that VICTOR units will take all you can give them . . . and more, thanks to VICTOR's quality control testing program. Take cantilever strength for example. Apparatus insulators are continually taken from the production lines and tested to destruction in the VICTOR Mechanical and Electrical Laboratory. Incidentally, the cantilever strength ratings given VICTOR apparatus insulators in our catalog are EEI-NEMA minimums. Actual test data shows that they withstand as much as twice these ratings before failing.

WE REALLY WORK 'EM OVER!

Every individual VICTOR apparatus insulator is gauged for correct alignment and positioning of bolt holes, and given a routine tensile or "pull" test just prior to final electrical tests. High voltage testing equipment, designed and made by VICTOR, permits continuous high frequency and 60-cycle flashover testing of apparatus insulators to assure individual conformance to VICTOR's high standards.

PURITY IS HERE TO STAY!

Purified Porcelain has *proved* itself superior to any insulator porcelain ever made. Here are some of the more important advantages you get when you buy VICTOR: • Improved thermal resistance. *Purified* Porcelain expands and contracts more uniformly during sudden temperature changes • Unmatched hardness and density resulting in rock-like strength • Better torsion, tension, cantilever and impact values • Smoother, harder glaze with unequalled self-cleaning characteristics • Uniformity of product never before achieved.

CAST IRON "CORSET"

Ladies used to use 'em to hold themselves in attractive alignment. We use 'em to hold caps, shells and pins of our apparatus insulators in perfect alignment. By using an individual *tempered cast iron jig* for each individual insulator, all shells, caps, pin and bolt holes seat perfectly; are accurately aligned. Rows of these insulators, each in its own "corset," are continually in process at our plant.

For full information on VICTOR Apparatus Insulators, write I-T-E Circuit Breaker Company, Victor Insulators Division, Victor, N.Y.

I-T-E CIRCUIT BREAKER COMPANY

VICTOR INSULATORS DIVISION

A NEW WRINKLE IN NETWORK DESIGN

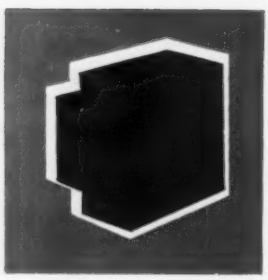
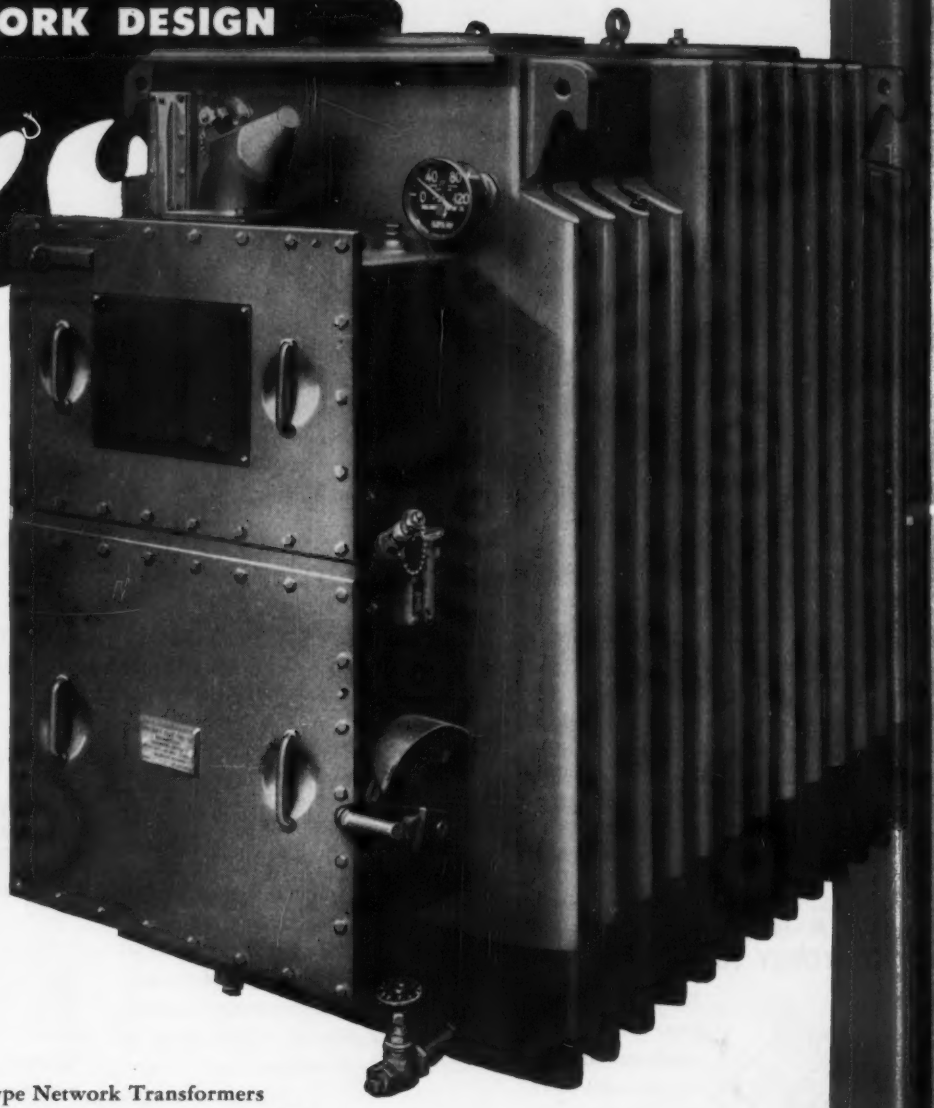


Diagram illustrates savings in space of new design as compared with older type network transformer.



Moloney Subway or Vault-Type Network Transformers with corrugated tanks are strong, rugged units developed by Moloney to answer some of the problems associated with the use of network transformers.

These units are built to conform to the EEI-NEMA Standards for Network Transformers or to conform to customers specifications.

Moloney Network Transformers offer your system the performance, dependability and trouble-free service expected of all Moloney products . . .
Specify Moloney Transformers for Quality . . . All Along The Line.

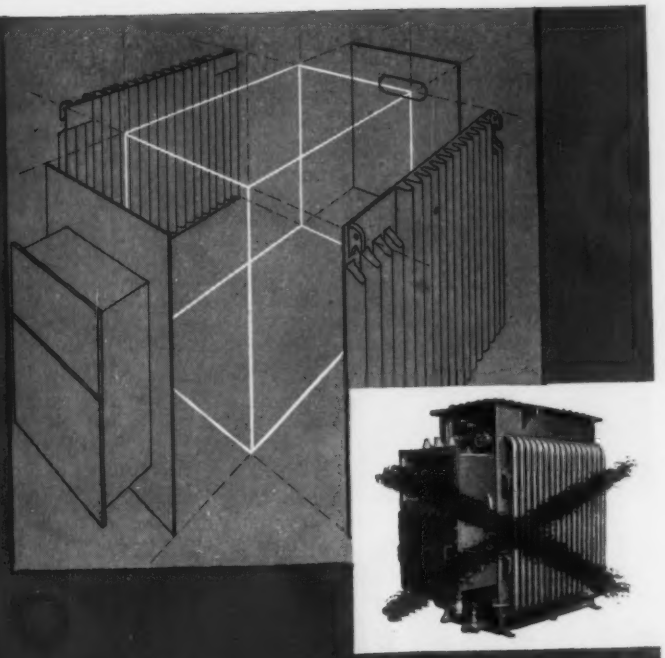
MX60-13

MOLONEY ELECTRIC COMPANY

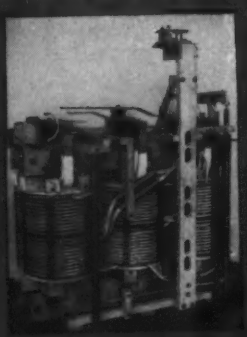
Manufacturers of Transformers for Utilities, Industry, and Electronic Applications

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

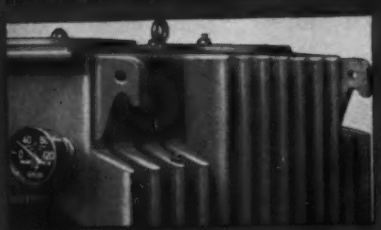
REAL TANK CORRUGATIONS



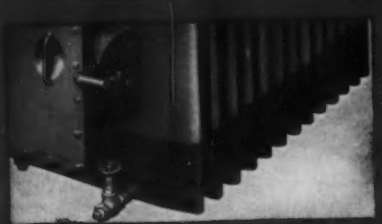
RUGGED CORE-AND-COIL UNIT



INCREASED MECHANICAL STRENGTH



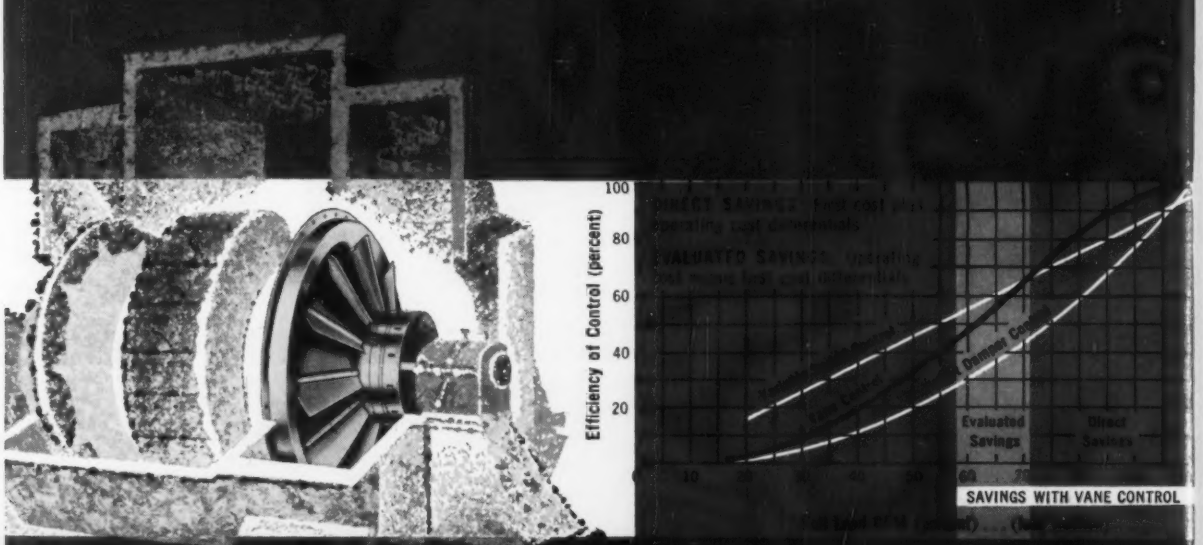
SEALED AGAINST MOISTURE



UNDERCOATING OF TANK BASE AND LOWER TANK WALLS

DON'T SPEND $12,000 ON A $4,000 JOB

and still lose money on operating costs!



Westinghouse Inlet Vane Air Spin Control
is the best way to regulate forced and induced draft fan volume with constant speed motors

* Lower First Cost * Lower Operating Costs * High Efficiency

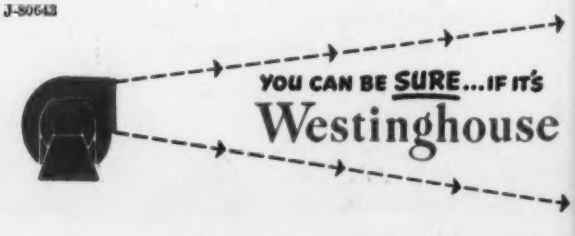
Specify this simple, reliable and mechanically foolproof regulator of fan output for your combustion control. Action is smooth. Response to exact pressure and volume requirements is instantaneous, adjustment precise.

Westinghouse Vane Control can be used on Forced and Induced Draft! Available in distinct designs for clean air forced-draft and coal-fired induced-draft applications.

Hundreds of power plants are benefiting from the economy and effectiveness of Westinghouse Inlet Vane Control on Forced and Induced Draft Fans.

Call your local Sturtevant Division Sales Engineer today, or write Westinghouse Electric Corporation, Dept. D-8, Hyde Park, Boston 36, Massachusetts.

J-80643



MANUFACTURERS BRIEFS

General Electric will spend $15 million on its plant in Schenectady this year. Most of it will be budgeted to renovate manufacturing facilities and to purchase new tools: horizontal drilling machine installed by the large motor and generator department ($300,000); a test stand for gas turbines ($160,000). Some of it will be spent for completion of major projects: a $3.7-million large steel casting facility and a $825,000 facility for balancing and spinning turbine rotors at high speeds . . . A flexible fiber or fabric, graphite, now produced in textile form, promises to be a plus factor in the space heating equipment field. **National Carbon** has developed the material which, they say, has excellent thermal and electrical characteristics. Price, at $1.50 per sq ft, may be reduced later . . . **Allis-Chalmers** has received an order from Consolidated Edison for a second 340-Mw turbine. Like the other A-C is building for Con Ed's Astoria No. 4, it will be a 3600/1800-rpm, 2000-psig, 1050/1000 F, close-coupled, cross-compound steam turbine and fully-supercharged generating unit. Both units incorporate many improved design features to control expansion and minimize distortion . . . Within two weeks after receiving the order, two generators were rushed from **A. G. Schoonmaker Co** on the West Coast and installed to meet a peak-season emergency for Florida Keys Electric Cooperative Association. The 750-kw and 300-kw portable diesel generators were leased, shipped and installed on a temporary basis . . . **Sylvania's** new line of fluorescent lamps which, the company claims, achieve record light outputs "ahead of schedule" are boosting 40-watt lamp output from 69 to more than 70 lumens per watt; 75-watt lamps from 71 to over 75 lumens per watt . . . Interchangeable bushings have now been adopted as standard for all **General Electric's** 23 to 196-kv power transformers. "TBI" (transformer-breaker interchangeable) bushings conform to all ASA standards while providing complete interchangeability between GE power or medium transformers and circuit breakers. Unless specified, the bushings will be installed on all units.

KEES SOCKET METER COVER

Fits All Standard "S" Type Meters

Made from 16 gauge zinc-coated, rust resistant steel and finished in gray baked-on enamel, the KEES Socket Meter Cover is designed to prevent breakage of glass on socket meters and to insure long service in any climate. Outside diam.—8" and depth—5⅝" and over. Metal cover is also reported to minimize damage from excessive current surge due to electrical storms.

Write P. O. Box 737 for Free Electrical Catalogue.

F. D. KEES MFG. CO.
BEATRICE NEBRASKA

Since 1874

Are you burning a lot of midnight oil when faced with tough wire and cable problems?

MEET THE MAN

WHO CAN HELP YOU...

. . . on page 122

aren't you really above routing slips?

In all fairness to yourself and your job responsibilities, don't you deserve your own personal copy of Electrical World? Your name, title and residence address on your letterhead will bring you 52 issues of Electrical World. Make a better impression, more job headway. The cost—only $6. No need to send money now.

Electrical World
330 West 42nd Street, New York 36, N.Y.

yep...enter my subscription

to 52 issues of Electrical World—delivered each week to my home. You can bill me later for $6...

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Firm_____

Electrical World
330 West 42nd Street, New York 36, N.Y.

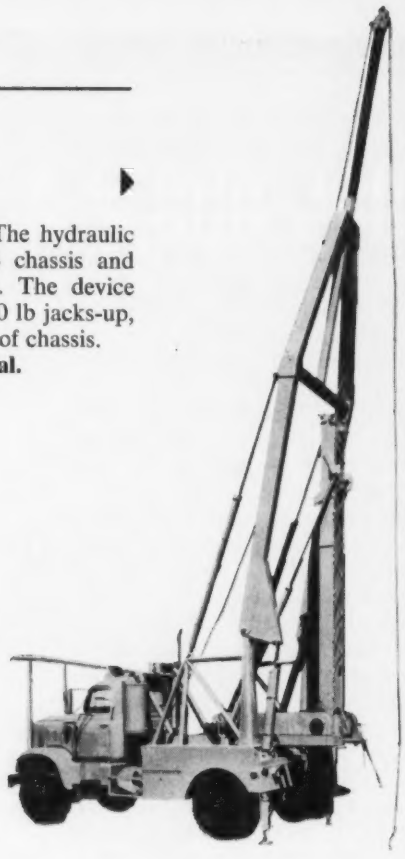
H-3

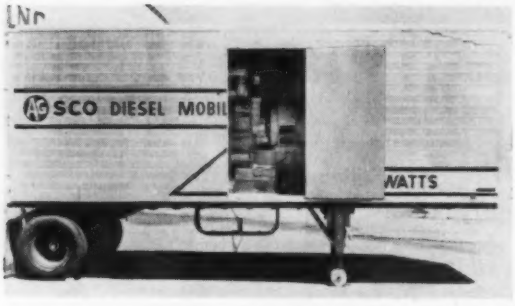
New Equipment

(For additional information, use Reader Service form, p 104)

Pole Setter . . .

. . . is designed to handle 100-ft Class A poles. The hydraulic derrick is mounted on a special FWD 326 4x4 chassis and uses a heavy-duty International boring machine. The device has a capacity of 12,000 lb jacks-down, and 10,000 lb jacks-up, with a sheave height of 40 ft, extended 5 ft to rear of chassis.
Calavar Corp, 2700 S Broadway, Los Angeles, Cal.





Emergency Generator . . .

. . . may be used during changeover of lines and substations in emergency conditions. Each unit contains a General Motors 450-hp Model 8-268-A diesel engine and a Westinghouse 300-kw, 375-kva generator with switchgear and radiator.
A. G. Schoonmaker Co, Spring St, Sausalito, Cal.

Aerial Cable Clamp . . .

. . . of spacer type in two sizes provides a messenger diameter range from $\frac{6}{16}$ to $\frac{5}{8}$ in. The clamp assembly consists of a pole plate spacer unit which permits attaching messenger and cable spacer 4½ and 9½ in. respectively from the pole surface. An extra groove is cast into the spacer body to accommodate an optional pole ground wire.
Malleable Iron Fittings Co, Branford, Conn.

Digger . . .

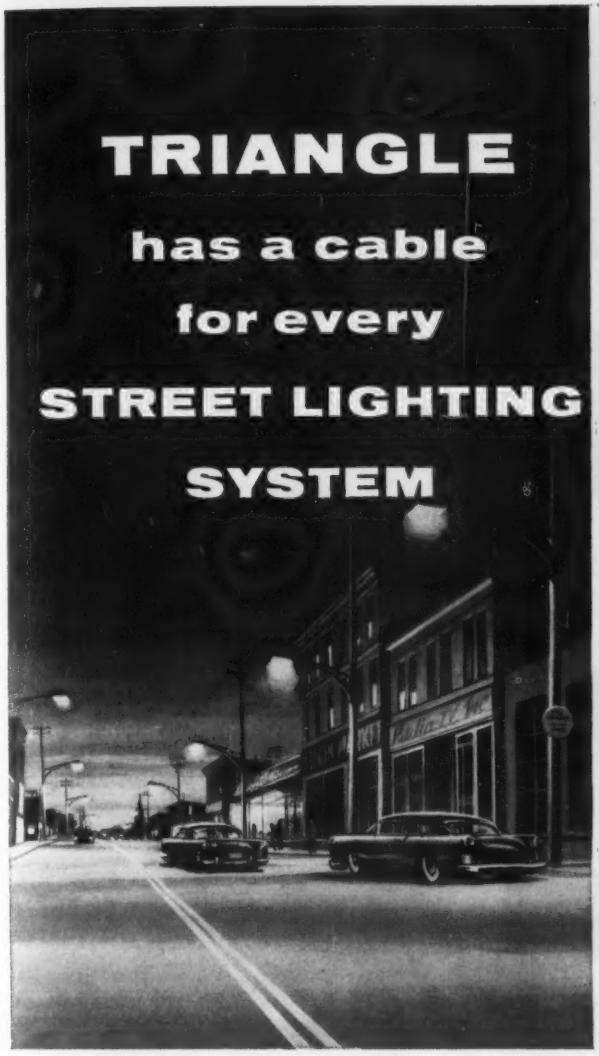
. . . digs holes up to 10 ft 6 in. deep and 9 to 30 in. in diameter. Known as the Series EM-2 "Earth-Master", the unit does not interfere with normal derrick operation. A pole can be suspended from the derrick during digging to permit setting the pole as quickly as possible. The auger is guided by a rigid twin-column telescopic support which rests on ground during digging. The frame is attached to a universal joint mounting bracket which permits digging at angles.
Powers-American Div, McCabe-Powers Body Co, 5900 N Broadway, St. Louis 15, Mo.

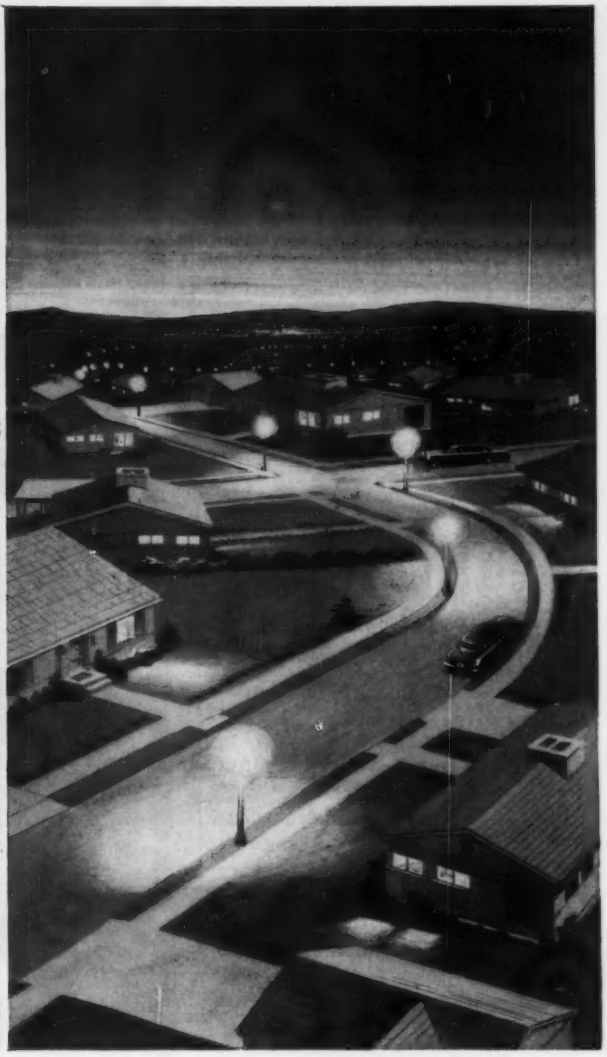
AC Test Sets . . .

. . . are available from stock in four standard ratings, 20,000 to 50,000 v and 2 kva (one hour). The devices use an oil-filled, corona-free trans-

(*Continued on page* 102)

TRIANGLE has a cable for every STREET LIGHTING SYSTEM





Each street lighting job has different requirements calling for a specialized type of cable. Triangle has four basic types—each designed to handle a specific set of service conditions. The distribution engineer can select the *one right kind* for his situation, eliminating costly overdesigning and preventing system outages due to underdesigning.

* Triozone insulated, Trioprene sheathed—Series Street Lighting Cable. Single conductor cable for direct burial and duct installation. 2001 to 5000 volts.

* Rubber insulated, lead sheathed—Series Street Lighting Cable. Single conductor cable, available with or without double steel tape armor. 0 to 5000 volts.

* Trioseal or Triolene insulated—Series Street Lighting Cable. Single conductor cable. Extra thickness of insulation available for severe service. 0 to 5000 volts.

* Trioseal insulated, Triolene sheathed—Pole and Bracket Cable Twin conductors. 4001 to 10,000 volts.

These cables are described in a new bulletin, just off the press.
Write for your copy.

TRIANGLE CONDUIT & CABLE CO., INC.

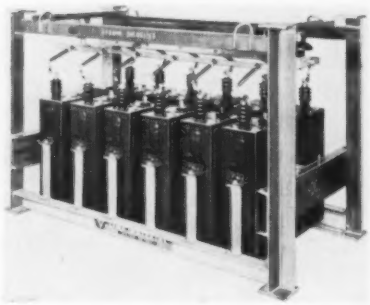
NEW BRUNSWICK, NEW JERSEY

"It MUST Be Right!"

AC Test Sets . . .

(*Continued from page* 100)

former, a safety contactor in addition to a magnetic circuit breaker, and are push-button operated. They test basic insulating materials, motor and small transformer insulations, circuit breakers, panels, linemen's gloves and other apparatus.
General Electric Co, Schenectady 5, N. Y.



Capacitor Blocks . . .

. . . are factory assembled for use with 100-kvar units in open-type banks at transmission, subtransmission and distribution voltages. A standard block consists of two rows of 100-kvar capacitor units, 5 or 8.7-kv class, connected in parallel and mounted in a welded aluminum frame. Available blocks have capacities of 600, 800, 1,000, 1,200, 1,400, 1,600, 1,800 and 2,000 kvar.
Line Material Industries, McGraw-Edison Co, Milwaukee 1, Wis.

Splicing Tent . . .

. . . helps speed repair of aerial cable. The tent is translucent and allows natural daylight to flood the lineman's working area. At night,

(*Continued on page* 104)

99.6%
SURE

Of all manufacturers of power capacitors only C-D puts each and every unit through a full voltage energization test before shipment to you. This is why C-D delivers an unbeatable 99.6%-sure performance

PERFORMANCE

in the field.

15, 25, 33.3, 50 and 100 KVAR capacitors for every application with lowest dielectric unit stress and highest major insulation level. Invest your purchasing dollar in internal quality—the only place where it counts. See your C-D representative or write Cornell-Dubilier Electric Corp., Dept. EW-49, South Plainfield, N. J.

SPECIFY

Consistently *Dependable*

CORNELL-DUBILIER

POWER-FACTOR CAPACITORS

Readers Service

For additional information on new products, supplies, and services in this issue, the Manufacturers Editor of Electrical World offers his facilities. Check items in which you are interested in list below:

NEW EQUIPMENT

Calavar .....Pole Setter ☐
Schoonmaker .....Generator ☐
Malleable Iron .....Clamp ☐
Powers-American .....Digger ☐
GE .....Test Set ☐
L-M .....Capacitor Blocks ☐
Herculite .....Tent ☐
T&B .....Connectors ☐
Royal .....Couplers ☐
Chipman .....Weed Killer ☐
Westinghouse .....Transformer ☐

OTHER

Manufacturers Editor
Electrical World
330 W. 42nd St.
New York 36, N.Y.

* **Note: Requests must be received within four weeks of publication date, accompanied by complete information specified. This service cannot be offered to readers in foreign countries or to competitive manufacturers.**

NAME _____
TITLE _____
DEPT. _____
COMPANY _____
ADDRESS _____
_____
_____

FOR:

Reference ..... ☐
Specs ..... ☐
Trial ..... ☐
Purchase ..... ☐

APRIL 13, 1959

Splicing Tent . . .

(*Continued from page* 102)

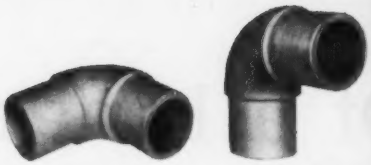
only a spot light at the base of the pole is needed to furnish light. The tent is waterproof and unaffected by mildew and rot.
Herculite Protective Fabrics, 125 Sussex Ave, Newark 3, N. J.

Compression Connectors . . .

. . . for substation work can be installed in seconds with a lightweight tool which delivers 12-ton force. Connectors and dies are color-keyed to speed installation. Tool installation range is from No. 14 to 750 MCM aluminum or copper. A hot tin finish on all connectors in the line permits their use on both aluminum and copper conductors.
Thomas & Betts Co, 36 Butler St, Elizabeth, N. J.

Welding Couplers . . .

. . . for 5-in. IPS aluminum pipe feature internal support design that supports conductor beyond the heat-affected zone. The Type WW-90 elbows, Catalog No. 56443, provide ample reinforcement to compensate for the loss in strength due to welding. Connectors are made from a self-aging aluminum alloy.
Royal Electric Mfg Co, Inc, 1122 E 87th St, Chicago 19, Ill.



Weed Killer . . .

. . . kills deep-rooted weeds and grasses and has prolonged soil-surface action on shallow-rooted grasses, weeds and seedling growth. New growth is inhibited for a year or more. Known as "Chlorea Granular", the compound is non-poisonous and does not create a fire hazard when used as directed.
Chipman Chemical Co, Inc, Bound Brook, N. J.

Dry-Type Transformer . . .

. . . in a 500-kva size has been added to the line of DT-3 dry-type 3-phase distribution transformers. The line includes ratings from 30 to 500 kva in either 600 or 5,000-v class. Weight and size of the new unit has been reduced as much as 50% below previous designs.
Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.

Are you making a lot of frantic phone calls when a single call to the right man would serve all your wire and cable needs?

MEET THE MAN WHO CAN HELP YOU...

. . . on page 122

WHEN PROLONGED OVERLOAD overheats the transformer windings, top oil temperature rises; tank wall gets hotter; and the L-M Thermal Overload Indicator drops its red signal light or luminous yellow tube to indicate the overload. No interruption of service; no costly periodic load checks. Fits any make of conventional transformer up to 100 kva.

Utilize Full Transformer Overload Capacity With L-M Thermal Overload Indicator

Cuts costs of load checks; helps maintain continuity. Alnico magnetic mounting bracket makes installation easy on *all* makes of conventional transformers. Choice of red signal light or luminous yellow tube signal.

Utility companies have been buying L-M's Type D Thermal Overload Indicator in large quantities for a number of reasons. The unit is simple; it is easy to install; and the cost is less than a $10 bill.

The indicator eliminates costly periodic load checks, by providing a *continuous* load check instead. It helps prevent transformer burnouts by giving ample warning. In addition, it avoids service interruptions because it doesn't cut off the transformer load; it simply *indicates* the existence of an overload.

L-M's indicator, compensated for ambient temperatures, measures tank-wall temperature, which in turn reflects top oil and hot-spot temperatures. It indicates a prolonged overload with a red light that drops down and turns on, or with a drop-down luminous yellow tube.

The small cost provides a most favorable return in both savings and service continuity. Ask the L-M Field Engineer for Bulletin 57105 or a sample. Or write Line Material Industries, Milwaukee 1, Wisconsin.

ALNICO PERMANENT MAGNET holds the L-M overload indicator firmly to the tank wall.

LINE MATERIAL® Industries

McGRAW-EDISON COMPANY

Protective Equipment

381

DISTRIBUTION TRANSFORMERS • KYLE RECLOSERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS • POWER SWITCHING EQUIPMENT
PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING • LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT

CLUSTER-TYPE POLE-MOUNTED RACK, pre-wired, with switches, ready to install. Available in 600, 900, and 1200 kvar. Three frames are bolted to the pole mounting bracket and to each other. These racks may be hoisted in three sections, or may be bolted together on the ground and hoisted as a complete unit.

Here's L-M's Outstanding New Line of 100 kvar Capacitors, Equipments

L-M announces a revolutionary new 100 kvar stainless-steel Elemex capacitor which is smaller, lighter, more compact because of transformer-type cooling; a complete new line of corrosion-proof aluminum-alloy hangers, racks, blocks.

by **N. K. DELANEY,** Product Manager
Capacitors and Regulators
Line Material Industries

All 100 kvar capacitors announced to date present the utility man with a problem of excessive size and weight. To overcome this problem, Line Material research engineers have developed a revolutionary new capacitor design.

Cool . . . Cool . . . Cool!

In this new L-M 100 kvar capacitor, transformer-type liquid circulation makes possible a very substantial weight and size reduction, and keeps hot-spot temperatures even lower than in L-M's (or others') 50 kvars! The design provides cooling ducts in sides and ends of the tank. Elemex Liquid circulates freely up between the packs and down the sides, keeping temperatures low. Tanks are stainless steel with heat-radiating paint finish.

NEMA-Standard 15⅝" Mounting

The new Elemex is the only 100 kvar that meets NEMA-standard mounting dimension of 15⅝ inches—the same as 50 kvar and smaller units! This makes it possible to replace two 50's with one 100 kvar—*in the present rack.*

Full Line of Hangers, Racks, Blocks

A complete line of hangers, racks, and blocks has been specially designed for these 100 kvar units. All are light, strong, corrosion-proof aluminum alloy.

The line includes the following:

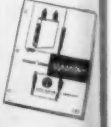
- single-unit hangers (100 kvar).
- 3-unit hangers (300 kvar).
- single-row pole-mounted racks for 300, 600, and 900 kvar.
- cluster-type racks for 600, 900, and 1200 kvar.
- block frames with ratings from 600 to 2000 kvar in 200 kvar increments.
- elevating structures

JUST LOOK AT THESE FIGURES!

Brand	Over-all Height	Tank Width	Tank Thickness	Mounting Dimension	Weight 2400 V 100 kvar
L-M	32 7/16"	13½"	9⅛"	15⅝"	185 lbs.*
Co. B	33⅛"	20"	7½"	22⅝"	270 lbs.
Co. C	33½"	25"	5½"	27⅛"	260 lbs.

**15% less per kvar than L-M's own 50 kvar.*

NEED WE SAY MORE?



Why Wait? Act Now! Discuss this new L-M 100 kvar Elemex Capacitor with your associates. Get in touch with the L-M Field Engineer right away—or wire or phone Line Material Industries, Milwaukee 1, Wisconsin, to reserve the supply you will need.

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LINE MATERIAL® Industries

McGRAW-EDISON COMPANY

DISTRIBUTION TRANSFORMERS • KYLE RECLOSERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS • POWER SWITCHING EQUIPMENT
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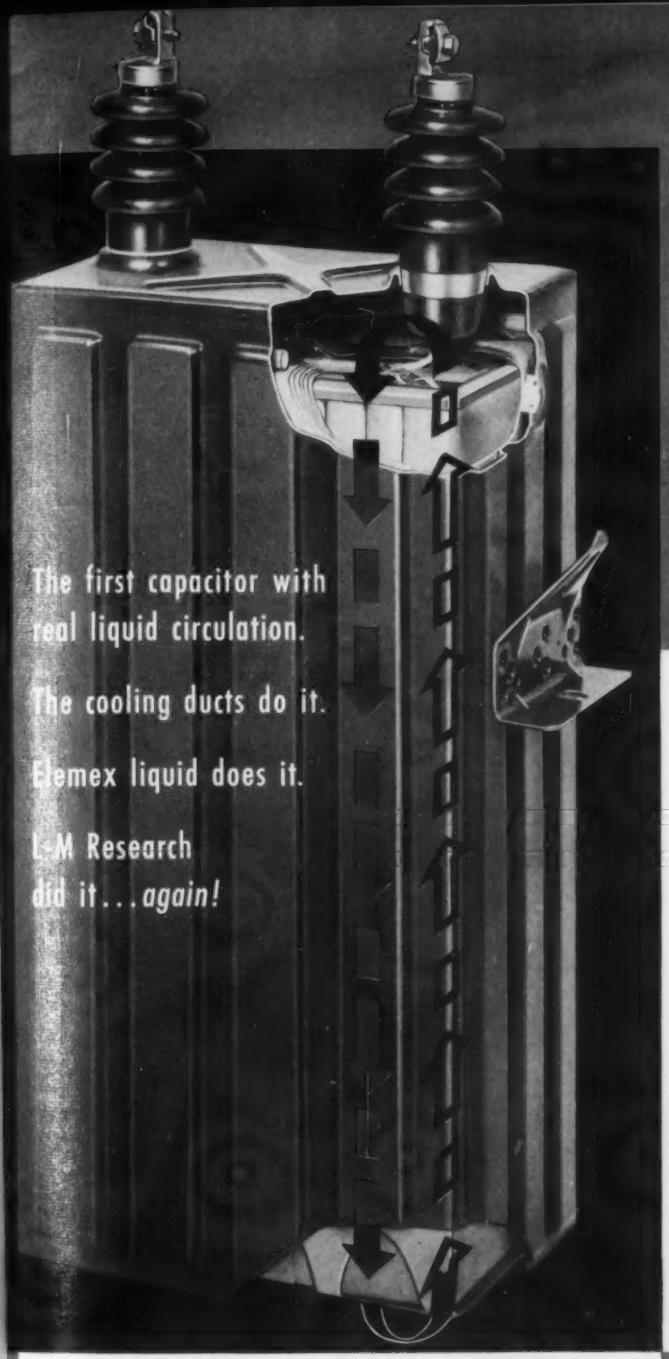
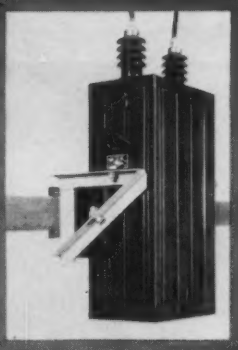


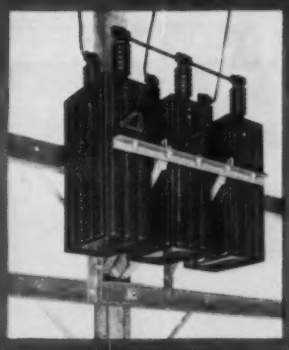
The first capacitor with real liquid circulation.

The cooling ducts do it.

Elemex liquid does it.

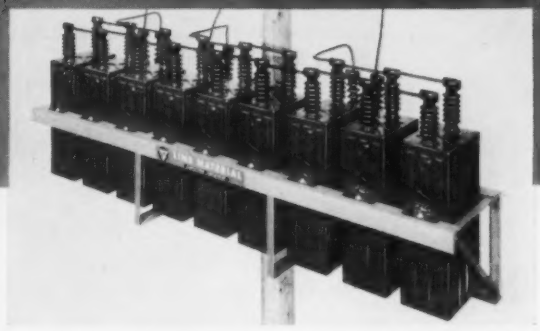
L-M Research did it... *again!*



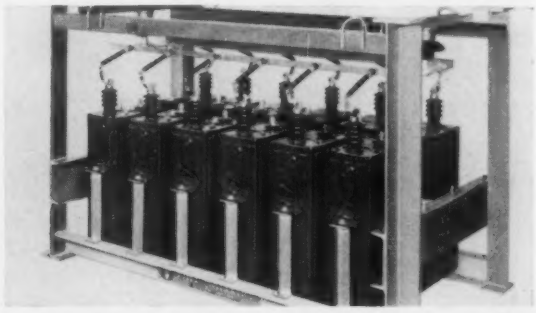


SINGLE-UNIT CROSSARM HANGER.

THREE-UNIT HANGER. All have ground clamp for either aluminum or copper conductor.



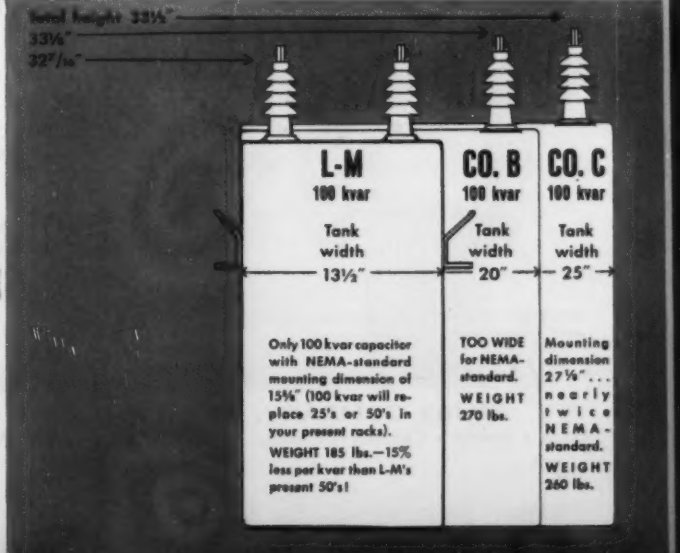
SINGLE-ROW pole-mounted racks are available for 3, 6, and 9 units—300, 600, and 900 kvar. All these racks are of welded construction. Galvanized steel pole bands (instead of using through-bolts) are an optional accessory.



BLOCK FRAMES are of all-welded construction, jig-assembled for accurate alignment. Ratings are 600 to 2000 kvar in 200 kvar increments. Fuses have 4000-amp. interrupting capacity each. Space saving averages about 25%, in comparison with blocks of 50 kvar units.

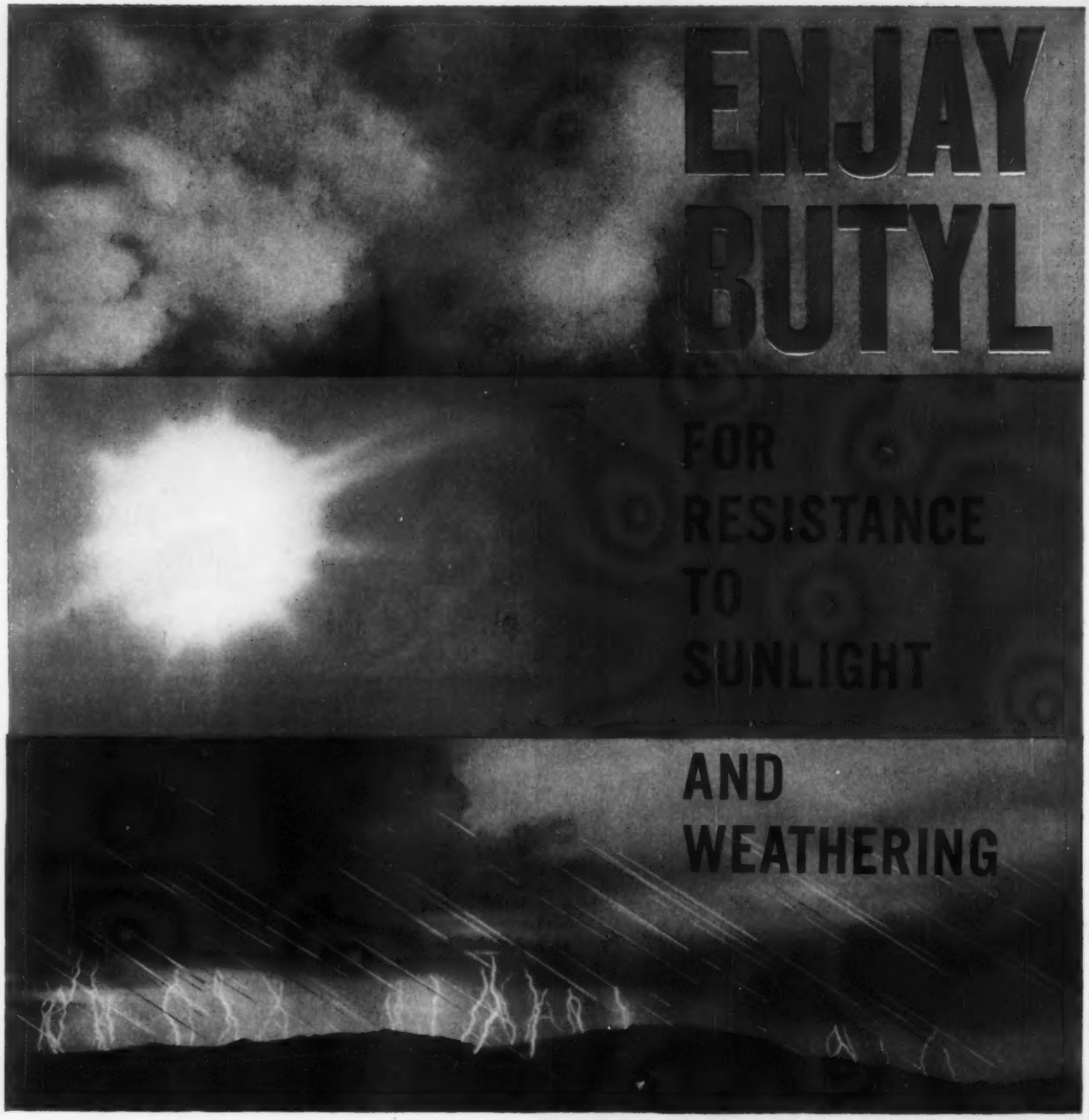
THE HOT-SPOT TEMPERATURE of L-M's new 100 kvar is even lower than that of 50 kvars, because of this new transformer-type liquid cooling. The Elemex Liquid rises between and around the packs, then goes down through the ducts and is cooled. The packs are cooler, because the heat comes out!

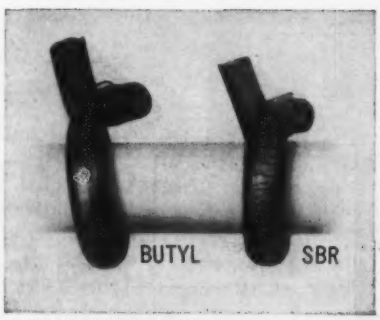
DIAGRAM shows how compact the new L-M Elemex capacitor is. Note also the weights. The lighter weight and narrower tank reduce bending moment on the pole, make capacitors and racks easier for linemen to handle and hoist.



Elemex Capacitors

McGRAW EDISON





Butyl's high resistance to ozone is graphically demonstrated when compared with SBR or natural rubber

Enjay Butyl rubber has demonstrated for many years its outstanding ability to resist deterioration caused by sunlight and weathering. This inherent resistance of Butyl to ultra-violet light, ozone, oxidation, moisture and mildew, has made possible many new and colorful products. Butyl has also increased the life of other products such as weatherstrips, protective coating, garden hose, wading pools and many automotive parts.

Butyl *also* offers...outstanding resistance to chemicals, abrasion, tear and flexing . . . superior damping qualities . . . unmatched electrical properties and impermeability to gases and moisture.

For more information call or write the Enjay Company.

ENJAY® BUTYL

EXCITING NEW PRODUCTS THROUGH PETRO-CHEMISTRY

ENJAY COMPANY, INC., *15 West 51st Street, New York 19, N. Y.*

Akron • Boston • Charlotte • Chicago • Detroit • Los Angeles • New Orleans • Tulsa

The CI&P Street Lighting Story

(*Continued from page* 73)

resentative discusses a different aspect of modern street lighting.

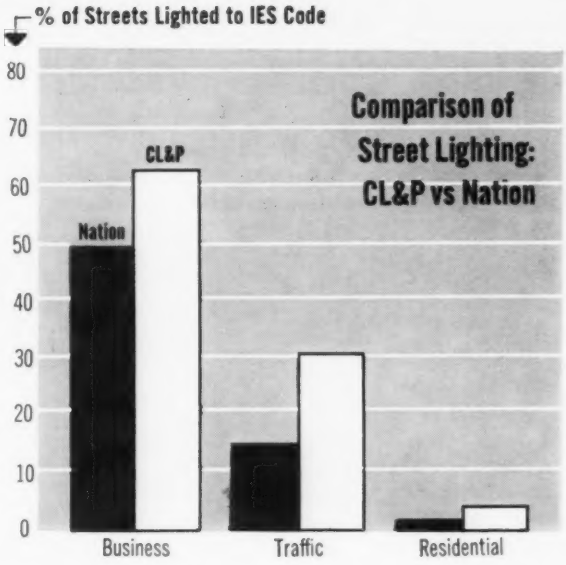
As an illustration of what such a program is like, let me give you the agenda of one of our meetings last year. The GE representative showed a film, "Crossroads of Light" depicting the application of various types of modern street lighting on the trial streets at their new street lighting center in North Carolina. The Westinghouse representative described "The Optical or Prismatic Control of Street Lighting" and demonstrated this with prisms of the kind used in modern street lights.

The Joslyn Mfg Co representatives talked about and presented a colored film showing the production of luminaires from the start of the assembly in the factory to the final attachment on a pole. The Wheeler Reflector Co representative described and showed a film titled, "Silhouette-Vision" depicting seeing at night under modern street lights. The Line Material representative discussed new developments in light sources and illustrated his talk with slides and equipment.

Then, our local street lighting representative explained various applications of each of the major types of modern street lights with reference to some recently completed jobs and some proposed ones. The meeting closed with a discussion period. Take-home kits were available, containing manufacturers' advertising brochures and other printed material on street lighting.

From September to December, we have what we call dinner survey meetings. Each one is confined to a single town. Eventually, every town will be covered by a "code" survey. These survey meetings provide us with the opportunity to present to the officials of each town the results of a street lighting survey of their town that our representatives have made.

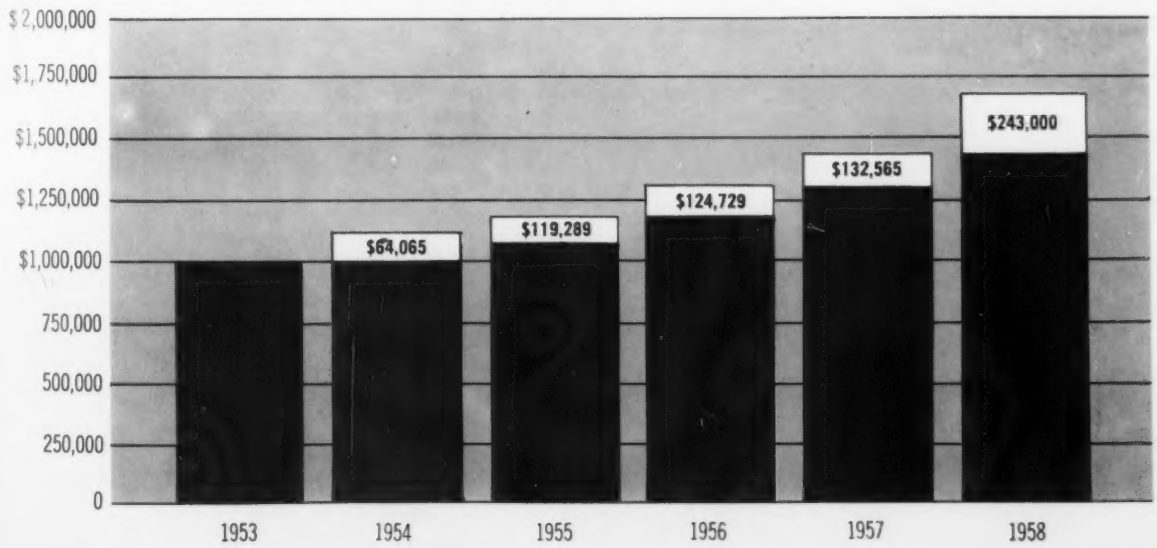
The making of a "code" survey requires too much work for one street lighting representative, so we assign one man from each of seven of our districts to assist him for a few days. Four teams of two men each survey the town, which is divided into quarters, with one team responsible for each quarter. These items, with coded maps, make a complete survey of existing lights on every street and compare the present level of illumination with code lighting standards.



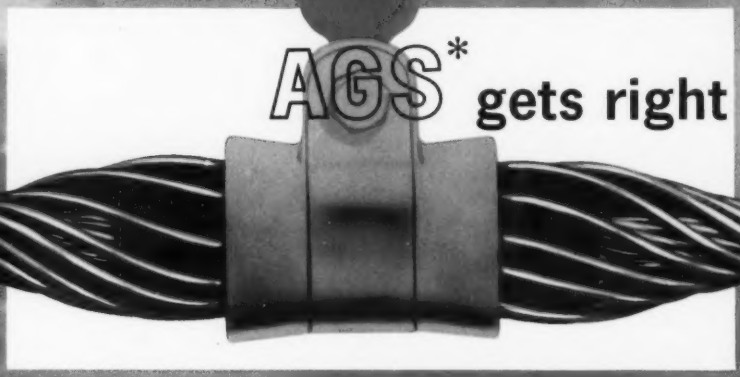
The results of the survey are presented to town officials at a dinner meeting with recommendations for adopting a three or five year program. At this time a trial offer is made: CL&P will install up to 50 luminaires at no additional cost to the town. At the end of 90 days, or longer if desired, we will remove the installation—no charge, no obligation. A three-year program is stressed and the following standard offer is made: With authorization from any community accepting 90% minimum of the survey, CL&P will install every luminaire recommended within 12 months.

(*Continued on page* 119)

How CL&P Street Lighting Revenues Increased Since 1953



AGS* gets right to t C



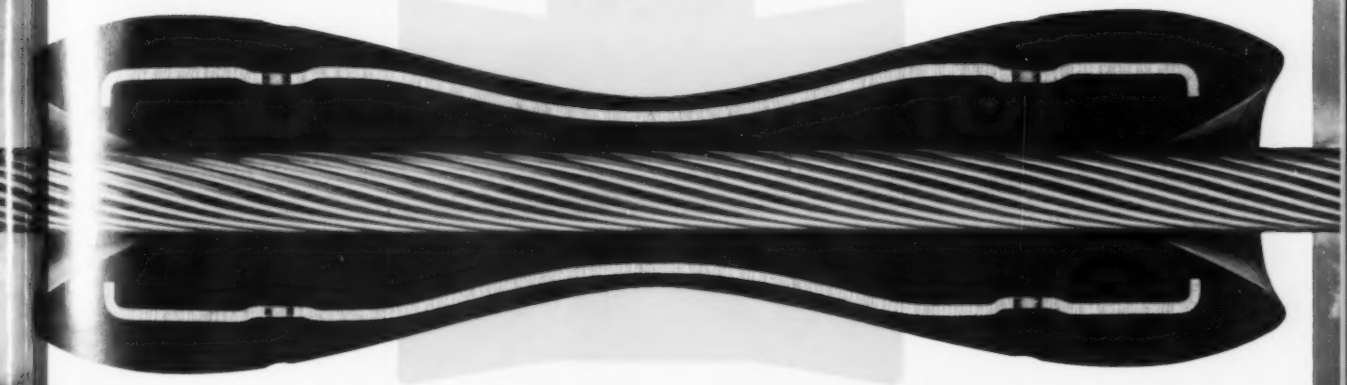
Comprehensive new folio tells how and why AGS* eliminates line failures.

Send for your copy:

PREFORMED LINE PRODUCTS COMPANY
DEPT. A
5349 St. Clair Ave. • Cleveland 3, Ohio

t CORE of line failure

nothing could be easier

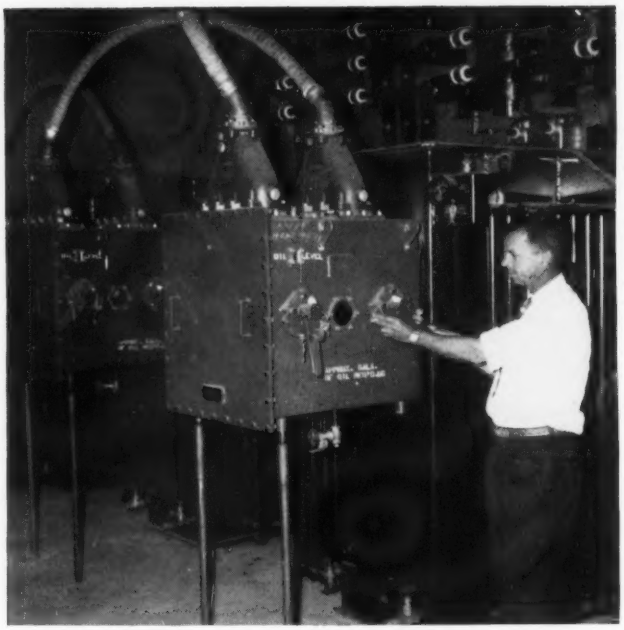


(on a vibrating conductor)

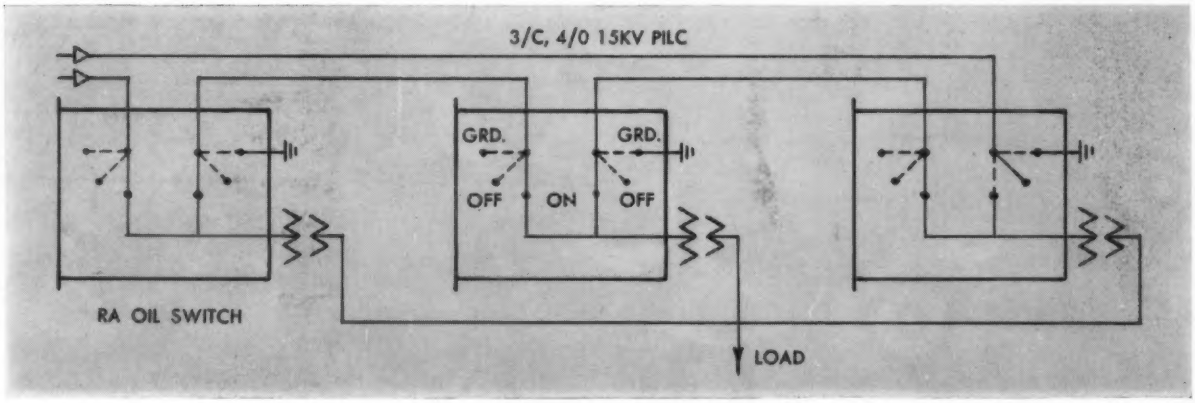
than the exclusive reinforced neoprene cushion inside the Preformed Armor-Grip* Suspension... AGS*

You can look up to Preformed*

Trade mark* Patented — U. S. Patent No. 2,722,393



LOOP AROUND COSTLY SERVICE INTERRUPTIONS



Expensive service interruptions to a large building are minimized by looping feeder cables through G&W RA oil switches. The load is supplied by a southern utility through two feeders and three 3 phase transformers. Any two transformers or either feeder cable can carry the load for a short time. Looping the feeder cable through the oil switches (attached to transformers) permits disconnecting and grounding the feeder cables and interconnecting cables. The RA manually operated switch will safely break a full 400 ampere load at 15000 volts.

An economical RA load break oil switch is made to suit your distribution system plans. Consult a G&W representative about it.

VOLTAGE CHARACTERISTICS

voltage rating	60 cycle withstand dry	impulse withstand 1½ x 40 wave
7.5kv	36kv	95kv
15.0kv	50kv	110kv
23.0kv	70kv	150kv
34.5kv	95kv	200kv

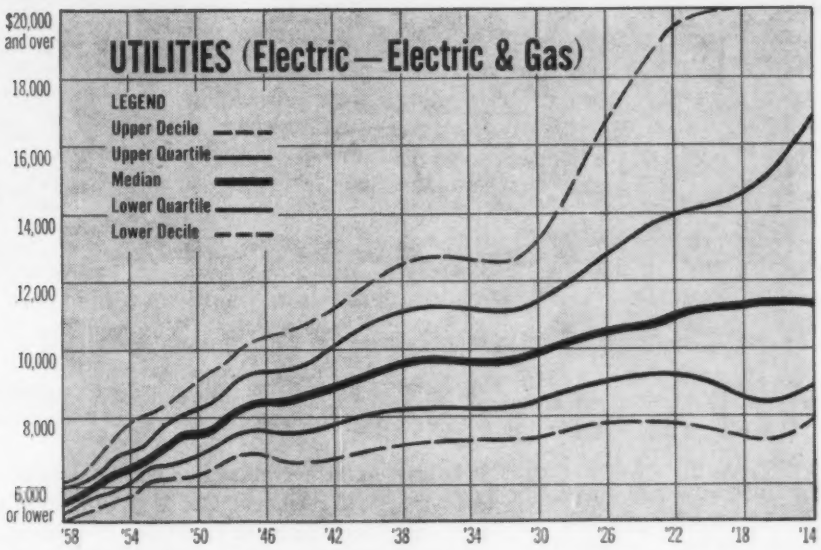
CURRENT CHARACTERISTICS

ampere rating	switch	amperes	
		momentary	4 seconds
400	standard	20,000	15,000
	special*	30,000	19,000
1000	standard	40,000	35,000
	special*	50,000	40,000

*silver inlaid contacts

G&W ELECTRIC SPECIALTY CO.
3500 WEST 127TH ST. • BLUE ISLAND, ILL.

D581



Engineers Joint Council measures . . .

The Utility Engineer's Paycheck

Engineers' Salaries

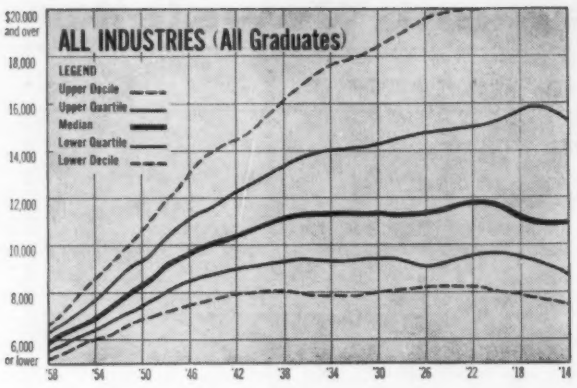
The chart above shows the distribution of utility engineers' salaries, as measured by the Engineers Joint Council in a 1958 survey of the engineering profession. The survey covered more than 190,000 engineers in all walks of professional activity—more than one-fourth of the nation's engineering force. Almost 10,000 engineers from electric utilities and combination gas-electric utilities were included in the sample.

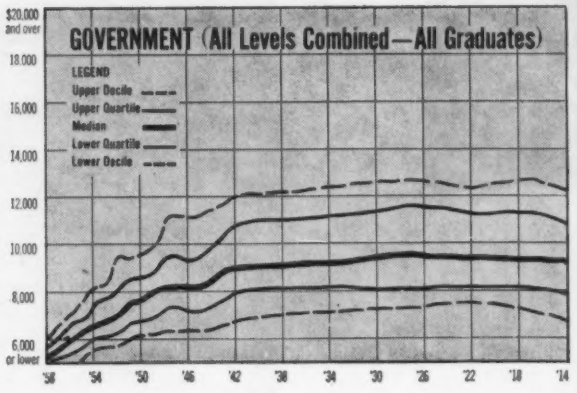
Last year the median salary paid by utilities to 1958 graduates was $5,575. This compares with a median of $5,100 paid in early 1956 to young engineers in the 1955 graduating class by utilities and sanitary services. These 1958 "starting" salaries ranged all the way from $7,750 to $4,500, compared with a range from $6,750 to $3,675 two years ago. The salary range of the entire utility sample is shown below in tabular form, arranged by year of graduation.

The top decile (10%) of utility engineers' salaries shows a steep rise after about 25 years of service. This is probably due to the relatively high proportion of management men who are recruited from the engineering ranks. The same trend

Here Are Average Salaries of Utility Engineers, by Year of Graduation

	1958	'57	'56	'55	'54	'53	'52	'51	'50	'49	'47-'48	'45-'46	'40-'44	'35-'39	'30-'34	'25-'29	'20-'24	'15-'19	'14 &
Highest	7750	8750	9250	10500	10500	11500	10800	13500	12500	13650	14650	20000+	20000+	20000+	20000+	20000+	20000+	20000+	20000+
Upper Decile	6125	6450	6925	7500	7900	8100	8425	8750	9125	9425	10100	10450	11250	12750	12500	15800	19500	20000+	20000+
Upper Quartile	5950	6100	6450	6900	7025	7400	7875	8075	8250	8575	9225	9350	10150	11250	11000	12475	13975	14850	16675
Median	5575	5775	6150	6400	6575	6875	7200	7525	7550	7825	8400	8450	8975	9700	9525	10400	10975	10550	11250
Lower Quartile	5225	5500	5775	5975	6125	6550	6600	6825	6900	7150	7600	7500	7825	8225	8275	8925	9225	8425	8900
Lower Decile	4950	5175	5425	5550	5650	6100	6175	6275	6375	6550	6950	6700	6750	7225	7300	7800	7775	7325	7900
Lowest	4500	4550	4250	4000—	4625	5250	5100	5075	4750	4750	4750	4250	4175	4175	5125	4750	4000—	5175	5675
Total Engineers	238	308	207	232	218	268	267	449	361	608	763	273	699	795	871	1366	1168	414	148
Numbers over $20,000	—	—	—	—	—	—	—	—	—	—	—	1	3	9	13	56	109	52	29
Numbers under $5,000	27	8	3	7	3	—	—	—	1	1	1	1	3	6	—	1	1	—	—





shows up in the broader "all industries" category, although the ascent is not so steep. Among engineers in government service, no such trend is apparent.

Significant to the overall picture was a flat increase granted by Congress last year to Civil Service engineers. Although salaries of engineers in government showed a greater percent increase than those in industry, the rise has not yet put government jobs in a competitive salary position with industry.

Similar EJC studies have been published in 1953 and 1956. Taken together, the studies have revealed a strong upward trend in earnings of engineers employed by industry. Between 1956 and 1958, the recession slowed but did not reverse this trend. Copies of the 1958 report, "Professional Income of Engineers," are available from the Engineering Manpower Commission, 29 West 39th Street, New York 18, N. Y., at $3.00 a copy. The next report is scheduled for 1960.

Van Wyck Calls for More A-Power Research

A clear call for more reactor research, and less crash construction of full-scale nuclear plants in populous areas was heard late last year by a small group from the American Institute of Electrical Engineers. The speaker was Allen Van Wyck, president of Illinois Power Co, and he aired his views on nuclear power development before the Central Illinois Section of AIEE at Decatur, Illinois. Because Van Wyck's remarks do much to clarify an issue that has been muddied by politics and emotion, they are reported here for consideration by a wider audience.

Nuclear Power

Van Wyck said that there are two main positions on the A-power issue, with a whole spectrum of opinions between: "First, there is the position of a majority of the private electric companies . . . These people say that private industry is perfectly capable, and can be depended upon, to develop nuclear power plants well before they are really needed and also long before they can produce electricity as economically as fossil fuel plants. They see development of nuclear plants by private industry taking place in an orderly and economical way and in plenty of time. They see no reason for an enormously expensive crash program on the part of the government. They also are aware that if the government does develop and build these plants, government will almost certainly own and run the electricity business of the future, or a big part of it. In fact, they believe that the real motive of those who advocate a government crash program is ownership and control of electric power.

"In the opposite camp are those, in and out of government, who say that speedy development of nuclear power is so urgent that the government cannot stand by and wait for private companies to get the job done. They say . . . that private industry simply does not have the money, the resources, or the will to get it done in time. To wait for private power companies to develop nuclear power plants, they say, is to invite national disaster. Cost, they say, is no object. While some of them claim that the matter of ownership of the electric business is irrelevant, others frankly and joyfully presume government ownership. It is certainly no coincidence that almost all of the advocates of crash development by the government are also advocates of, or friendly to, public power."

But is "urgency" the real issue? "If we look at the facts," said Van Wyck, ". . . we can all recognize the need for urgency without getting hysterical about it." Here are the facts that Van Wyck emphasized:

1. **There is at present no shortage of electric power in the U. S.,** except in a few communities that depend on hydro.
2. **Present reactor development indicates that it will be from 10 to 20 years** before the cost of producing nuclear electricity will be close to the cost of producing it from fossil fuels.
3. **How long fossil fuel reserves will last** is not so important as how long they will be cheaper than nuclear energy as a means of making steam. Further, within 20 years (the inside estimate of our fossil fuel reserves), we should have nuclear energy harnessed to our power plants anyway.
4. **Regardless of the size of fossil fuel reserves, the day is not far off** when "burning them up to produce steam will be considered too wasteful, since there are many other known uses for these fossil fuels."
5. **"What is left of the urgency argument tends to evaporate** when our State Department, as well as thinking people outside government, point out that it is urgent that the U. S. get on with nuclear power development for purely political reasons. We are told that it would be very hurtful to us all over the world, among friend and foe alike, to have the Russians come in with a good nuclear plant for generating electricity ahead of us. Who wants to argue against this? Who can?"

ALLEN VAN WYCK

Van Wyck continued: "We can all agree that the need is urgent (giving each other a little leeway on what constitutes urgency) and proceed to the more important question: 'How do we most expeditiously and safely go about developing the best way to make electricity from nuclear energy?' "

He attacked "the notion that it is necessary to construct large-scale plants in populous areas in order to find out how best to make electricity cheaply, copiously, and safely from nuclear energy.

"The best way to get rid of this notion is to take a good look at it," said Van Wyck. He explained that a nuclear reactor is basically a device for producing steam, but a device which presents great engineering problems and requires many safety precautions. "In the power plant at Dresden," he pointed out, "the experiment is really concerned only with the reactor and the production of steam. The steam-turbine and the electric generator are of conventional design. In fact, the turbine might be considered to be of antiquated design, since it is required to operate only at the low pressure and temperature of steam to be produced in the nuclear reactor.

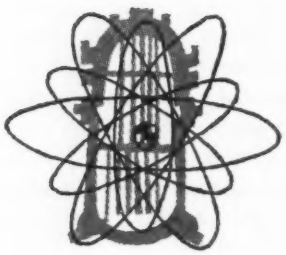
"We already know how to make electricity from steam," he continued. "Our problem is to learn how to make steam safely and cheaply in a nuclear reactor. That is why I do not believe that it is necessary or provident to build nuclear power plants in order to learn how to harness the atom most expeditiously . . . we would do much better to devote ourselves to experimentation with the problems of constructing a good, safe nuclear reactor.

"I have tried to make it clear that it is both expensive and inhibiting to conduct these experiments in populous centers. It is inhibiting because you do not dare take a chance with what you do not know, and, by definition, you conduct an experiment to find out what you do not know.

"To me it seems sensible to experiment with the construction of nuclear reactors capable of producing super hot steam in the most remote desert or mountain wilderness. This would permit much more free and safe experimentation at the heart of the problem—the nuclear reactor."

Van Wyck urged thorough study of the hundreds of promising reactor concepts, first in the laboratories, then, if experimentation warranted, in pilot plants remote from populated areas. Elimination of electrical generating equipment from these pilot plants, he said, and the less exacting safety requirements possible in the wilderness, would make costs "from 30% to 50% less than commercial operations in populous areas." Furthermore, he said, more experimentation would be possible—"and you would learn more faster."

"The advocates of a government crash development program," he went on, ". . . urge government-financed construction of nuclear power plants with generating facilities for production of electricity in populous areas. They will agree with you that the problem is really the construction of a good, safe reactor, but they will tell you that it would be too wasteful if the steam produced in the reactor were not used for the generation of electricity.



"We have a right to ask them if they are more interested at this stage of the game in making electricity or in learning how to make it from nuclear energy. Their argument that it would be costly to waste the steam does not square with their original argument that this is a crash program in which cost is no object.

". . . Once we accept that our real need is for a good, safe nuclear reactor, the need for heavy government financing diminishes to the disappearing point. In fact, if we were to concentrate during the next five or ten years on the development of nuclear reactors and on the best and safest methods for making steam, we would not need significant government financing at all. I do believe that the privately owned electric companies of this country are quite capable of solving this problem without any government assistance, beyond normal scientific cooperation and the use of government wilderness land.

"If each of the private electric companies . . . were to contribute 1% of their 1957 gross electric revenues to research and development on the problems of a nuclear reactor for five years, we would have a fund of $80 million a year, or $400 million for five years. Personally, I believe it would be a wise investment for the private electric companies to commit $1 billion now for a ten-year program. By concentrating on what we need to know, this would be plenty, I am convinced, to solve the problem for our country and for the world.

". . . It seems to me that the race between government and private power interests to build nuclear power plants instead of concentrating on research is both costly and foolish. I do believe that private industry could put an end to this competition by coming forth with the kind of plan I have suggested. It would be the shortest, safest, and cheapest way home.

"The best hope in getting private interests to make the necessary investments, it seems to me, is that the private electric companies—and their stockholders—will awaken to the fact that their existence and investments are at stake. They must realize that the way to survival and continued prosperity is to devote their resources with energy and imagination to this problem. When that happens, and I believe it will happen soon, another triumph for our system of private initiative and private capital will be in the making."

Cut load survey costs two-thirds

With Westinghouse Load Survey Recorders: Westinghouse Load Survey Recorders now put fast, accurate and economical load research methods within the grasp of all utilities, regardless of size. Continuing changes in system loads emphasize the need for accurate data on utility load characteristics. Efficient load building, based on sound load factor data, is as valuable as savings realized through more efficient generation.

Survey reports enable you to pinpoint sales promotion efforts in those areas where desirable additional load can be added. Ask your Westinghouse sales engineer to show you how Westinghouse Load Survey Recorders can help improve revenues on your system. Watch Westinghouse meters for the Bonus Value Beyond Specifications.

YOU CAN BE SURE...IF IT'S **Westinghouse**

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV MONDAYS

CHECK THESE EXCLUSIVE WESTINGHOUSE LOAD SURVEY RECORDER BONUS VALUES

House-quiet operation
(Absolutely silent, cannot disturb homeowners)

Lowest cost, most efficient survey device available
(Readily adaptable to all meter applications—with or without socket)

Can be adjusted to 15 - 30 - or 60 - minute demand intervals
(Capable of operating at full meter load)

600-ft tape capacity - ¼-in. standard
(Mylar* backed tape is resistant to heat and humidity. Enough for 32 days—reusable indefinitely)

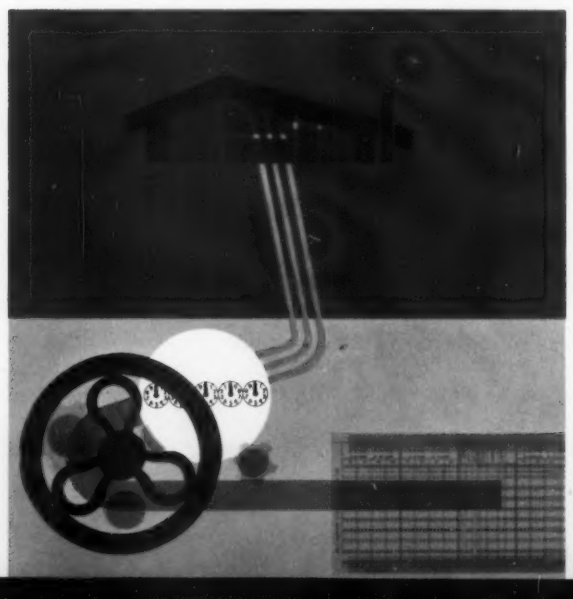
"Playback" of all data can be put on either standard IBM cards or paper tape
(Permanent time and demand record, including survey data, date, meter constant, etc.)

Fully automated tape translation
(Eliminates tedious and time-consuming clerical work)

Pull-out, Plug-in installation
(Lightweight, compact construction. No special permission or wiring required)

Watch the mail for this brochure, or get one from your Westinghouse sales engineer. It explains how Westinghouse Load Survey Meters operate, and how they can save money for you.

*DuPont registered trade-mark



YOU CAN BE SURE...IF IT'S

Westinghouse

JI-40495

The CL&P Street Lighting Story (*Continued from page* 109)

There will be no increase in annual charges until ⅔ of the job is completed at which time billing will be increased by ⅓ of the total. At the end of 12 months, annual charges will be increased to ⅔ of the total with full billing starting at the end of the second year.

Frequent, friendly contacts with town officials are important. When we do have dinner with them, an alert street lighting representative can often get much useful information that he can use to advantage in presenting a sales story that will eventually "trade up" the community to code lighting. Also it gives him an ideal opportunity to correct any misinformation about his company's street lighting program which the official may have.

Any degree of success we have in street lighting promotion is dependent upon our ability to work with town or city fathers and to convince them that better street and highway lighting is a good buy. The more informed town officials are about good street lighting design—correct types of luminaires and light sources, the reasons for recommended mounting heights, proper spacing, etc.—the more receptive they are to proposals for extending and improving it.

When you get town officials joining you in an effort for better community lighting, the chances for success are greatly increased. A utility that tries to handle the entire street lighting effort all by itself is trying to make progress with a shovel instead of a bulldozer.

Street Lighting Publication Started

We recently started a 4-page street lighting publication, "The Standard". It is distributed quarterly to about 600 town and city officials in our service area.

We run brief stories of the latest advances in street lighting, the bigger street lighting jobs done in the previous quarter, striking "before" and "after" pictures of relighted streets, and pictures and thumbnail descriptions of some of our district street lighting men. On occasion we run little articles related to street lighting by a town official concerned with the subject.

We have also been making some use of informational advertising. Ads appear about once every two months and we've presented a street lighting story as a commercial on the weekly TV show the company sponsors.

Now what have we to show for our efforts?

Our street lighting revenues increased some $326,000 in three years, of which $220,601 was attributed to promotional efforts. For the same period, the total promotional expense was $16,275. Consequently, for every dollar spent on promotion, we realized an increase in revenue of $13.50. How many other types of sales promotion can even approach so good a return?

But the progress can be measured not only in money. For instance, over the past five years our average lumen output per fixture has shot up from 2,418 in 1952 to 3,889 in 1957, an increase of more than 50%.

We have turn-on ceremonies for all of our larger street lighting projects when they go into operation with the mayor or first selectman turning on the switch. Sometimes, for a really spectacular improvement in the community's lighting, you can do much more than a simple turn-on ceremony. For instance, three years ago, when we completed the installation of 64 flourescent street lights in the center of the City of Bristol, we had a big "Festival of Light" to celebrate the occasion. We did much of the work ourselves, but we also had the help of the city administration and many merchants.

There emerged a two-mile parade with more than 100 marching units, bands and floats from all over the state, a brief speaking program and turn-on ceremony, selection of a "Queen of Light" who was crowned by the Miss Rheingold of the year, a block dance and special merchants' activity.

Criticism is made that this is just a lot of hoopla and whether it does any good. Well, the direct result of the Bristol "Festival of Light" was the sale of fluorescent lighting systems to three neighboring towns.

There is one aspect of street lighting and the town or municipal budget that is little realized and worth pointing out. Most communities today can afford much better street lighting protection than ever before. Average family income has increased from $1631 in 1936 to $5520 in 1955. Even after allowing for inflation this represents a substantial increase in family income.

Virtually everyone can afford and carries much more life insurance today than was common 20 years ago. Therefore, why shouldn't communities feel that they should properly carry more street lighting insurance than was customary in the past. Towns are buying protection against crime and accidents as well as assuring themselves of a superior level of community life.

If Americans can afford to spend about 16 *billion* dollars on new cars each year, then they can well afford to increase the less than 1% of that sum that they now spend on street lighting to improving the seeability and over-all quality of their communities at night.

More Lighting to 'Code' Needed

To have the rich and elaborate motorized civilization that we do and at the same time grossly inadequate street lighting is like having a mansion without a lighting system. Fifty percent of our main streets meet "code" lighting standards, whereas only 15% of our traffic streets and a tiny 2% of our residential streets are "code" lighted. On an estimated total mileage basis we have lighted only 7% of our streets to the Illuminating Engineering Society's "code" recommendations which are minimum standards for good street lighting. (See chart top of page 109).

In view of the population growth, new housing developments, and the impressive amount of highway and road construction, this meager 7% figure would suggest that we're hardly keeping up with present opportunities, to say nothing of reducing the tremendous street lighting backlog of the past. The encouraging thing about it, though, from a sales point of view, is precisely that the field is so relatively undeveloped. Even if all of us keep racking up spectacular sales increases year after year, there seems to be a danger of running into a saturated market for as far ahead as one can see.

Now, we've got something that our communities need, and there are millions of dollars of street lighting revenue just waiting for us. There are also millions of dollars worth of excellent public relations combined with the revenue. Street lighting should be in the top growth category in utility companies for years to come.

News About People

Cooper Named Vice President

Lloyd E. Cooper has been promoted to vice president and chief engineer of the California-Pacific Utilities Co.

He joined California-Pacific in 1954 and has been vice president since April 1957 with responsibilities over rate matters and gas operations. In his new position, he will be responsible for engineering and planning as well as continuing supervision over rates and commission matters.

Prior to joining the utility he was gas supervising engineer on the staff of the California Public Utilities Commission. His 33 years of utility experience includes other positions with the commission from 1937 to 1954. And for 12 years he was associated with Pacific Gas & Electric Co and the former Great Western Power Co.

Ireland, LaFaso Elected VPs at Ebasco International

IRELAND

T. M. Ireland and S. A. LaFaso have been elected vice presidents of Ebasco International Corp, the wholly-owned subsidiary of American & Foreign Power Co. At the same time they were elected directors of the company, along with Myron G. Reed, executive vice president in charge of operations for A&FP, and Marvin S. Fink, vice president.

Ireland joined the Johnstown (Pa.) Water Co in 1936. For eight years he was training director for the Long Island Lighting Co. He started with Ebasco in 1955 in the training and safety field.

LaFaso has spent more than 29 years in the utility field, most of which have been devoted to sales promotion, advertising and publicity. He joined Ebasco International in July, 1957.

LA FASO

Fluor Corp Names Three New Vice Presidents

KNEUBUHL

DIETER

TAPPAN

The Fluor Corp has appointed James P. Kneubuhl vice president-utility sales; George H. Dieter, vice president-foreign sales; and David S. Tappan, vice president-domestic sales.

Kneubuhl joined Fluor in 1941, and eventually rose to vice president of eastern area sales. In 1955, he was appointed vice president of sales for Fluor's Engineering and Construction Division.

Dieter joined the company in 1940. He was appointed vice president-western area sales in 1952, and in 1955 vice president of sales, Fluor Products Co.

Tappan joined Fluor in 1952. He was appointed administrative assistant to the vice president and general manager of Fluor's Engineering and Construction Division in 1955. Two years later he was appointed district sales engineer in the New York sales office.

21 CONTROLS BY DELTA-STAR ASSURE YOU A QUALITY INSULATOR EVERY TIME

✓	1. **RAW MATERIAL**—control of moisture, shrinkage, screen analysis and slump.	✓	13. **VISUAL INSPECTION**—control for cracks and flaws due to firing.
✓	2. **FORMULA WEIGHT**—control of mixture by automatic tape recording.	✓	14. **DYE-PENETRATION TEST**—controls vitrification.
✓	3. **CLAY "SLIP"**—control of viscosity, Sp.Gr., pH, sulfate content.	✓	15. **HIGH-FREQUENCY TEST**—controls puncture-proof porcelain.
✓	4. **PARTICLE SIZE**—control to eliminate impurities and assure uniformity.	✓	16. **60-CYCLE TEST**—controls puncture-proof porcelain.
✓	5. **MAGNETIC SEPARATOR**—control to remove ferrous particles.	✓	17. **MECHANICAL TESTS**—control for loading characteristics.
✓	6. **FILTER PRESS**—control for shrinkage, thermal expansion, and body strength.	✓	18. **CEMENT TEST**—control of hardware-to-porcelain bonding material.
✓	7. **VACUUM PUG MILL**—control of de-airing and moisture content.	✓	19. **FINAL INSPECTION**—control for dimensions, alignment, and product quality.
✓	8. **UNFIRED WARE**—control for dimensions and surface finish.	✓	20. **CERAMIC LAB**—controls factory production ceramically.
✓	9. **"Q.T." TREATMENT**—control of rf interference material. A Thomas invention.	✓	21. **TESTING LAB**—controls factory production mechanically and electrically.
✓	10. **GLAZE APPLICATION**—control of thickness and deposit viscosity.		
✓	11. **SAND BAND**—control for bond strength and uniformity.		
✓	12. **KILN**—control of firing process.		

DELTA-STAR PORTER **ELECTRIC DIVISION**

H. K. PORTER COMPANY, INC.

For full catalog information on Delta-Star suspension insulators, write for publication #1000 to *Thomas Works, Delta-Star Electric Division, H. K. Porter Company, Inc., Lisbon, Ohio.*

DIVISIONS: Connors Steel, Delta-Star Electric, Disston, Forge & Fittings, Leschen Wire Rope, Mouldings, National Electric, Refractories, Riverside-Alloy Metal, Thermoid, Vulcan-Kidd Steel, H. K. Porter Company (Canada) Ltd.

MEET THE MAN

. . . who's dedicated to **your** job
. . . who knows your needs
. . . who knows your problems
. . . who knows wire and cable
. . . who is backed by engineering specialists
. . . who is backed by a reliable manufacturer

YOUR ROME CABLE SALESMAN

Holan Corp Makes Executive Appointments

George H. Eckels, above, is new vice president of engineering of the Holan Corp. He was formerly vice president and general manager of Holan Corp of Georgia. Herman J. Troche moves from vice president-engineering to vice president and consultant at Holan Corp, and Robert R. Rector becomes vice president and general manager at Holan Corp of Georgia.

In other changes at the Georgia branch, O. H. Stelter, Jr. is now vice president-engineering and manufacturing and Clifford Booker is secretary and treasurer.

Ricca Named Head of Hubbard Subsidiary

Hubbard & Co has elected J. A. Ricca, above, as president of their subsidiary Electrical Engineers Equipment Co. James M. Woodmansee was made chairman of the board of the company.

Ricca was formerly manager of the mobile communications division of Du Mont Laboratories, and before that held various managerial positions with the General Electric Co.

Fischer-Pierce Names Garnick to Top Sales Post

Fischer-Pierce Co and its affiliate. Sigma Instruments, Inc, has appointed Philip Garnick general sales manager. He replaces Karl H. Bohaker who resigned to become a partner of L. Parker Naudain, Sigma Sales Representative in the Middle Atlantic district.

Garnick, who has been with the company for 12 years, has served as chief engineer and project engineer for Fischer-Pierce and as an application engineer for Sigma. He holds several patents on photoelectric lighting control designs.

McKechnie Named Head of Power Bureau

John D. McKechnie has been named acting chief of the Power Bureau of the Public Service Commission, State of New York, succeeding Paul T. Kirschke.

McKechnie has been with the commission since 1933. He was first with the Rockland Light & Power Co and associated companies. In 1929, he went to Central America for several months, and then joined Elmira Water, Light and Railway Co, now part of New York State Electric & Gas.

MEET THE MAN

who's dedicated to **your** job

YOUR ROME CABLE SALESMAN:

Atlanta, Ga. (MU 8-9860) C. J. Murry, W. J. McCann; (PL 8-1794) F. D. Rucker

Baltimore, Md. L. D. Kernan

Birmingham, Ala. (TR 1-8955) R. H. Sawyer

Boston, Mass. (HA 6-7272) A. D. Stein, T. S. Gildersleeve, R. T. Gildersleeve, Byron Brewer

Buffalo, N. Y. (AM 3198) E. B. Jones

Charlotte, N. C. (EM 6-0864) W. W. Rambo

Chicago, Ill. (SP 2-2700) Stewart Johnston, T. C. Spriggs, J. A. May, D. B. Duffy

Cincinnati, O. (LI 2-0290) E. M. Groves

Cleveland, O. (SU 1-1240) J. F. Guyer

Dallas, Tex. (RI 7-4801) F. J. Peabody, J. L. Pearce, B. G. McDaniel

Denver, Colo. (KE 4-0533) E. T. Vonier, J. Vivian, K. Hall

Detroit, Mich. (TR 2-7578) A. K. Buckenmaier, B. F. Thomas

Houston, Tex. (FA 3-8385) G. A. Peabody, R. O. Witt, J. Jackson

Huntington, W. Va. (JA 3-5414) Thomas Orlovsky, Jr.

Indianapolis, Ind. (VI 6-2524) J. S. Scheppach

Jacksonville, Fla. (EV 7-5915) C. R. Stegin

Kansas City, Mo. (JE 1-4146) R. R. Davis

Lansing, Mich. (IV 4-0778) A. J. Dawson

Los Angeles, Calif. (RA 3-3631) H. S. Warren, O. O. Stedman, R. D. Golly, E. G. Gilmore, Jr., F. K. Duerst

Louisville, Ky. (TW 3-7512) Robert L. Jaffre

Milwaukee, Wisc. (BR 1-1101) T. E. McCarthy

Nashville, Tenn. (VE 2-0862) E. C. West

New Orleans, La. (VE 5-9210) W. Fulton

New York, N. Y. (MU 2-6590) E. T. Buckenmaier, W. S. Williams, W. R. Copp

Philadelphia, Pa. (MA 7-2070) W. A. Miller, G. E. Rolston, Jr.

Phoenix, Ariz. (AL 8-5281) Dick Barnes

Pittsburgh, Pa. (AT 1-0816) R. T. Edwards, Jr., J. W. Brunner, R. A. Gray

Portland, Ore. (CA 2-5470) Charles K. Shanks

Richmond, Va. (CO 6-3503) D. C. McMahon

St. Louis, Mo. (VO 3-4944) D. A. Thomas, J. W. Campbell, Jr.

St. Paul, Minn. (MI 6-7201) T. H. Stokke, W. Kufus

Salt Lake City, Utah (EL 9-8811) H. Lee Rawlings

San Francisco, Calif. (VA 6-3580) C. H. Kaufman, G. F. Black, G. H. Remelman, D. S. Smith

Seattle, Wash. (MA 4-3017) A. M. Mitrovich, L. R. Hennings

Syracuse, N. Y. (GR 4-5311, Ext. 1125) M. E. Damon

Torrance, Calif. (Los Angeles, NE 6-5704) R. E. Gates, C. E. Walden, Don Ensch, G. M. Armstrong

Tulsa, Okla. (RI 2-1704) W. D. Barwick

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NOW–AT LAST A MEASURING WHEEL THAT MEASURES ACCURATELY TO A FRACTION OF AN INCH!

Rolatape's amazing new Model 415 meets all your measuring needs — measuring quickly and surely over the most uneven and irregular terrain with no risk of human error. This time-saving instrument is calibrated to measure accurately in full view of operator as it is rolled along, giving measurements in inches (to ½ inch) on one side of measuring wheel, and tenths of a foot (to .5 of a foot) on the other. Sturdy and lightwight, it is equipped with automatic brake and built-in stand. Handle folds compactly. See one at your dealer's today.

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PERSONAL BRIEFS

Pennsylvania Electric Co has appointed **Ralph F. Bovier** to the newly created position of assistant to the vice president in charge of the company's technical department. **Paul L. Lumnitzer** succeeds him as superintendent of transmission.

Interstate Electric Co has named **Arthur M. Spencer** manager of the company's Hattiesburg, Miss., office.

W. A. Huckins, a veteran of 46 years with Utah Power & Light Co, and manager of the business development department will retire at the end of this year. **Darcie H. White** has been named manager of the department, and Huckins will act as a consultant.

T. J. McCall has been named superintendent of Greenwood Utilities, succeeding **B. Y. Buckley** who has retired.

Grover Cleveland Jones has become a consultant for Kentucky Utilities Co. **L. W. Haley** succeeds him as manager of the company's Blue Grass Division.

Jess Scoville has been made assistant to the general superintendent of Portland General Electric Co.

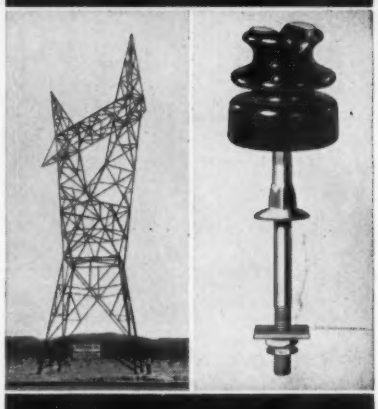
Gwilym A. Price, chairman of Westinghouse Electric Corp, and **Charles P. Crane,** chairman of the Baltimore Gas & Electric Co, will serve as vice-chairmen of the 1959 Special Gifts Campaign of the National Conference of Christians and Jews. **Philip Sporn,** president of American Electric Power Co, is chairman of the drive.

Graybar Electric Co, Inc, has appointed **G. H. Booth** manager, lamp sales.

William H. Loeber has been named marketing manager of the newly established electric home department of Westinghouse Electric Corp.

Jesse Stitzer has been named department manager of the High Voltage Systems Laboratory Section of Sorenson & Co.

Assemblies stay tight!



Connections stay tight!

—when locked with

PALNUT LOCK NUTS

FOR years, PALNUTS have been the standard lock nuts of the utility industry—on steel towers, wood pole hardware, connectors, disconnects, switches, fittings, transformers, etc. Here's why: PALNUT Lock Nuts stay tight under severest vibration, are very low in cost, apply fast and easily, require little space. Available in full range of sizes, in plain, Parkerized and Hot Dip Galvanized steel; also silicon bronze.

Samples and literature on request.

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51 Glen Road
Mountainside, N. J.

PALNUT
TRADE MARK
LOCK NUTS
for quick, secure fastening at low cost

SALES ASSIGNMENTS

Minneapolis-Honeywell Regulator Co has appointed Milo K. Henry manager of the Denver regional office of the military products group. His office will be at 1600 West 13th Ave, Denver, Colo. His territory will include the states of Kansas, Nebraska, Colorado, Wyoming, and Utah.

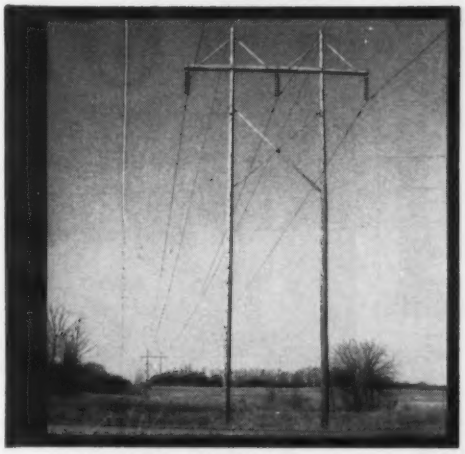
International Business Machines Corp, Data Processing Division, has made these changes: Charles R. DeCarlo has been named manager of marketing and service for the division. Reporting directly to Dr DeCarlo will be Clark Garrison, Jr, who has been made sales manager.

General Cable Corp has made these changes: J. B. Moore has been promoted to district manager of the southern California district with headquarters at 2906 Leonis Blvd, Los Angeles. F. H. Schonhoff has advanced to assistant district manager of the southern California district.

Motorola Communications & Electronics, Inc, has named Hoyt Stout regional sales manager in New Jersey, Delaware, and southeastern Pennsylvania. His office is at 7852 Montgomery Ave, Elkins Park, Pa.

Pittsburgh Standards Conduit Co has named two regional sales managers and three sales representatives. Raymond F. Becker has been made eastern regional sales manager for the New York and New England District with headquarters in New York. James D. Logan, named eastern regional sales manager for the Philadelphia-Baltimore-Washington district, will maintain headquarters in Philadelphia. Named sales representatives for the Baltimore-Washington area was Gerald L. Cronan, whose headquarters are in Baltimore. William A. Touhey was named sales representative for the Philadelphia area, covering eastern Pennsylvania and southern New Jersey. He will maintain headquarters in Philadelphia. Paul F. Richards, sales representative for the New England area, will maintain headquarters in Boston.

GALVANIZED STEEL STRAND

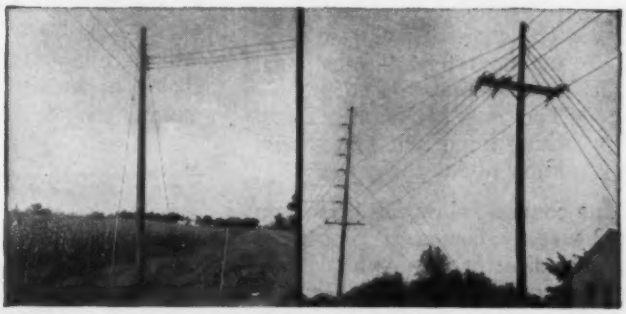


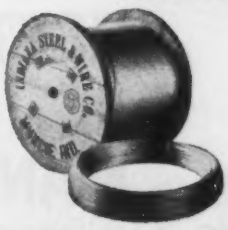
YOUR ASSURANCE OF HIGH QUALITY, LONG LIFE AND LOW COST

Close laboratory control over each step in manufacture has established Crapo Galvanized Steel Strand as a product of highest quality and dependability. You benefit through longer service life and lower ultimate costs.

Heavy, uniform, tightly-bonded coatings of commercially pure zinc, applied by the famous Crapo methods, withstand the punishment of construction, provide maximum resistance to corrosion and contribute to over-all economies.

For OVERHEAD GROUND WIRE . . .
CRAPO Weldless Galvanized Steel Strand





The most practical and economical strand for shielding transmission lines against lightning. Maximum strength and high fatigue endurance, inherent in Crapo Weldless Strand, provide that extra safety factor so important in overhead ground or static wire.

For GUYS and MESSENGER . . .
Crapo Galvanized Steel Strand. Made to highest standard specifications . . . a size and breaking strength to meet all practical needs.

Contact your jobber or write for descriptive folder.

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GIVE TRANSFORMERS
Full advantages
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Engineered by specialists to give *any make of transformer* the full economies and trouble-free operation of thermosiphon self-cooling. Design standard for the transformer industry—oval tubes assure optimum heat dissipating surface and free flow characteristics. Valves, flanges, and elbows available for any mounting condition.

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To the man on the route slip...

...the $6 you save —Is it worth it?

- Stacks of dog-eared copies piling up on your desk...
- The chore of trying to carve out time to read in the midst of office pressures...
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The coupon below will bring you 52 weekly issues of Electrical World directly to your home. You can pay the $6 later.

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Firm_____

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Cites Savings on Buses

Louisiana P&L speaker tells system and equipment group of economies with welded aluminum at Bogalusa Station

Bus assembly and connections by welding at Bogalusa Switching Station cost less than half what had been estimated for bolted bus construction, Morris Steiner Jr, Louisiana Power & Light Co. told the

Addresses MVEA Sales Meeting

Donald S. Kennedy, president, Oklahoma Gas & Electric Co, was banquet speaker at the recent commercial and industrial sales conference of the Missouri Valley Electric Association at Kansas City, Mo. His subject was his recent trip to Russia. Others in the photo are: Duane Arnold, Missouri Valley Electric Association president, and S. L. Paul, chairman, Industrial & Commercial Sales Committee. Theme of the meeting was "Sell benefits, not costs."

Are you wasting all kinds of time selecting the right wire and cable for your job?

MEET THE MAN
WHO CAN HELP YOU...

. . . on page 122

to EEI Group

Electric System & Equipment Committee, Edison Electric Institute, recently at Atlanta, Ga.

The method uses inert-gas welding to splice 2½-in. extra-heavy aluminum pipe main buses. Taps are smaller sizes of aluminum pipe cut and bent to fit and welded into a short stub of 2½-in. pipe welded to the main bus. The entire structure is supported by 115-kv insulator stacks on 4-in. steel lally columns at 20-ft separation. Switches and line terminations are on individual lattice towers.

Buses and switchyards are readily expanded, usually without removal of the station from service, Steiner said. Buses made in this manner have been used without failure since 1955.

Aluminum Competitive

Aluminum is now competitive with galvanized steel for station structures, according to G. W. Swanson, Consumers Power Co. Material costs 11% higher for three substations were offset by savings in shipping and erecting the lighter metal. The structures were assembled with aluminized steel bolts but welding is under study, he said.

A new electronic test probe helps Consolidated Edison personnel check 600 to 50,000-v circuits and equipment for potential and for removal of grounds, said W. J. Morrissey. The probe is usable on dc as well as ac, is directly grounded, and contains its own check test for serviceability. Indications are displayed by a microammeter and an indicating neon light.

Transistors Reliable

Transistors have proved reliable enough for use in power-line carrier equipment, said W. C. Feaster, Potomac Edison Co. Beginning with two sets installed in 1956, the total now is 11, all on relatively short lines. All installations have operated reliably after correction of bad joints during the first month. They have operated over 3 million transistors with only failure where comparable installations with electronic tubes average

(*Continued on page* 128)

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TEST BLOCKS
SOCKET EQUIPMENT

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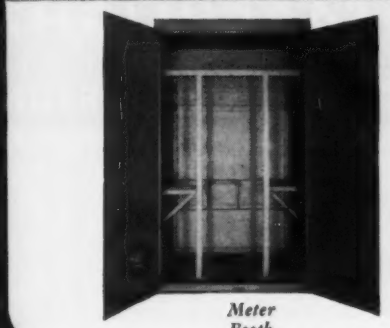
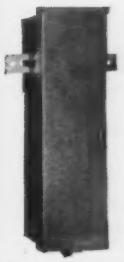
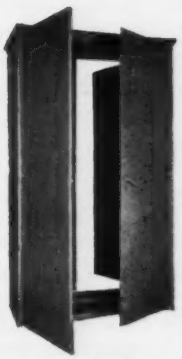


Meter Booth



Current Transformer Enclosure



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3—333 KVA W-H 67000-480

3—333 KVA W-H 2400-120/208Y

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3	500	Wagner	69,000–460
4	333	West.	67,000–7200
1	2500	Mol.	44,000–2400/4160, 3 Ph.
2	2500	Wagner	45,800/22,900–4160Y, 3 Ph.
3	500	G.E.	44,000–2400/4160
3	200	West.	44,000–480
1	5000	West.	34,500–13750/6875, 3 Ph.
1	3750	G.E.	34,400–13800/7960, 3 Ph.
2	3000	Upgf.	34,750–4160, 3 Ph.
2	1500	G.E.	34,400–2520, 3 Ph.
3	1000	A.C.	34,650/11,500–2300
3	500	Mol.	34,500–2300/4600
4	333	G.E.	34,650–7200/12470Y
3	200	A.C.	34,500–2400/7200/12470Y
3	333	G.E.	26,400–2420/4190Y
2	1500	G.E.	23,000–2400/4800, 3 Ph.
1	7500	A.C.	13,800–2400, 3 Ph.
3	1667	G.E.	13,800–600
3	667	Kuhl.	13,800–480
1	600	Stand.	13,200–2300, 3 Ph.
1	450	Penna.	13,200–2400, 3 Ph. Askarel
3	333	G.E.	13,200/22800Y–2420/4190Y
3	333	Mol.	7200/12470–2400/4160
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All jobs carry automatic within-grade increases for satisfactory service, liberal vacation leave, sick leave, and retirement benefits.

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APPARATUS EXCHANGE Two Rector St., New York 6, N. Y.

Cites Savings on Buses

(*Continued from page* 127)

approximately 15,000 hr tube life.

Relay operations involving transistor carrier have been correct, Feaster reported. Two faults on protected lines cleared and 35 on adjacent lines blocked tripping of unfaulted lines.

Winding failures need not occur on rotating machines in service unless load demands preclude shutdowns for test and repair or because of accident or shorted turns, said C. L. Sidway, Southern California Edison Co. No single electrical test gives complete security but overvoltage, either ac or dc, can be used to prove insulation strength. Test voltages should be high enough to assure continual service until the next scheduled test but low enough to safeguard good portions of the winding. He suggested 150% of line-to-line voltage for a 1 min ac test, 270% for dc, claiming frequent applications would not harm sound insulation.

Properly made dc tests can often be interpreted to reveal incipient failures without causing breakdown, Sidway said. Some operators might put such a machine back in service pending a convenient outage for repair, but Southern California Edison always tests to failure and repairs the winding, he said.

NEWS BRIEFS

• **Coos Bay, Ore., steam plant** has been proposed by Pacific P&L. The 100-Mw station would cost $20 million, and may be built along with a proposed hydro project.

Mouth-to-mouth method of artificial respiration has been approved by National Academy of Sciences National Research Council.

Industrial development sessions in New York, Boston and Philadelphia will help Puget Sound P&L tell financiers and industrialists of business prospects in its area.

Eminent domain powers of Mississippi P&L have been upheld by the state Supreme Court in a case over a power line right of way.

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The Meetings Calendar

APRIL

• **Institute of Radio Engineers**—Conference on Analog & Digital Recording & Controlling Instrumentation, Bellevue-Stratford Hotel, Philadelphia, Pa., April 20-21; 13th Annual Technical Conference on Electronic Data Processing, Engineering Societies Building, Cincinnati, Ohio, April 21-22.

Edison Electric Institute — EEI-AGA National Conference of Electric and Gas Accountants, Sherman Hotel, Chicago, Ill., April 20-22; Meter and Service Committee, Chase Hotel, St. Louis, Mo., April 27-29; Statistical Committee, Dearborn Inn, Detroit, Mich., April 30-May 1.

• **Conference of Bituminous Coal Research**—Annual Meeting, Sheraton Hotel, Chicago, Ill., April 21-22.

• **Lead Industries Association**—31st Annual Meeting, Drake Hotel, Chicago, Ill., April 22-23.

American Institute of Electrical Engineers—East Central District Meeting, Sheraton-Mayflower Hotel, Akron, Ohio, April 22-24; North Eastern District Meeting, Hotel Syracuse, Syracuse, N. Y., April 29-May 1.

• **Northwest Electric Light & Power Association**—36th Annual Spring Conference, Engineering and Operations Section, Hotel Utah, Salt Lake City, Utah, April 22-25.

• **Southeastern Electric Exchange**—Accident Prevention Committee, Hotel Arlington, Hot Springs, Ark., April 23-24.

• **Michigan Municipal Utilities Association**—Spring Conference, Warm Friend Hotel, Holland, Mich., April 23-24.

• **Pennsylvania Electric Association**—Communications Committee, Hotel Harrisburger, Harrisburg, Pa., April 23-24; Transmission & Distribution Committee, Pocono Manor Inn, Pocono Manor, Pa., April 30-May 1; Structures & Hydraulics Committee, Pick-Roosevelt Hotel, Pittsburgh, Pa., April 30-May 1.

• **Heat Exchange Institute** — The Homestead, Hot Springs, Va., April 29-May 1.

• **American Society of Mechanical Engineers**—Albany, N. Y. April 29-May 1.

• **First National Metals Engineering Conference**—American Society of Mechanical Engineers, Hotel Sheraton-Ten Eyck, Albany, N. Y., April 29-May 1.

• **Eighth Annual Conference for Protective Relay Engineers**—Sponsored by Illinois Institute of Technology, Chicago, Ill., April 30-May 1.

• **First National Youth Conference on the Atom**—The Claridge Hotel, Atlantic City, N. J., April 30-May 1.

MAY

• **Edison Electric Institute**—Prime Movers Committee, Palmer House, Chicago, Ill., May 4-6; Purchasing and Stores Annual Meeting, Hotel Soreno, St. Petersburg, Fla., May 4-6; Industrial Relations Committee joint with Personnel Committee of the Ohio Electric Institute, Netherlands Hilton Hotel, Cincinnati, Ohio, May 7-8; Transmission & Distribution Committee, Shoreham Hotel, Washington, D. C., May 7-8; Electrical System & Equipment Committee, Roosevelt Hotel, Pittsburgh, Pa., May 25-26.

• **Pennsylvania Electric Association**—System Planning Committee, Mountain View Hotel, Greensburg, Pa., May 4-5; Electrical Equipment and Industrial Sales Committee, Bedford Springs, Pa., May 7-8; 10th Annual Customer Relations Conference, Hershey, Pa., May 13; Accident Prevention Committee, Bedford Springs, May 14-15; Systems Operation Committee, Galen Hall, Wernersville, Pa., May 14-15.

• **Institute of Radio Engineers**—National Aeronautical Electric Conference, Biltmore Hotel, Dayton, Ohio, May 4-6; Electronic Components Conference, Benjamin Franklin Hotel, Philadelphia, Pa., May 6-8; Seventh Regional Technical Conference & Trade Show, University of New Mexico, Albuquerque, N. M., May 6-8.

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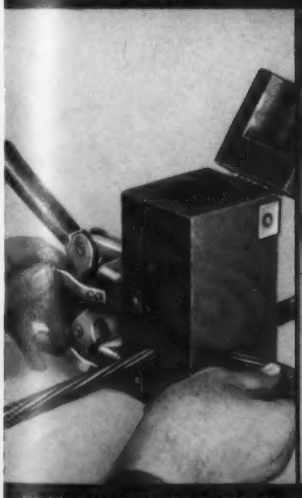
Get a permanent THERMOWELD connection quickly...never corrodes or loosens, costs little to install. Current-carrying capacity higher than conductors.



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Pour welding powder into mold, tap to release starting charge. Unique composition of starting charge prevents mixing with welding powder, assures positive firing. Slag easily removed.

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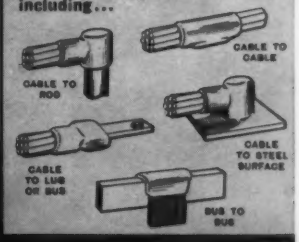

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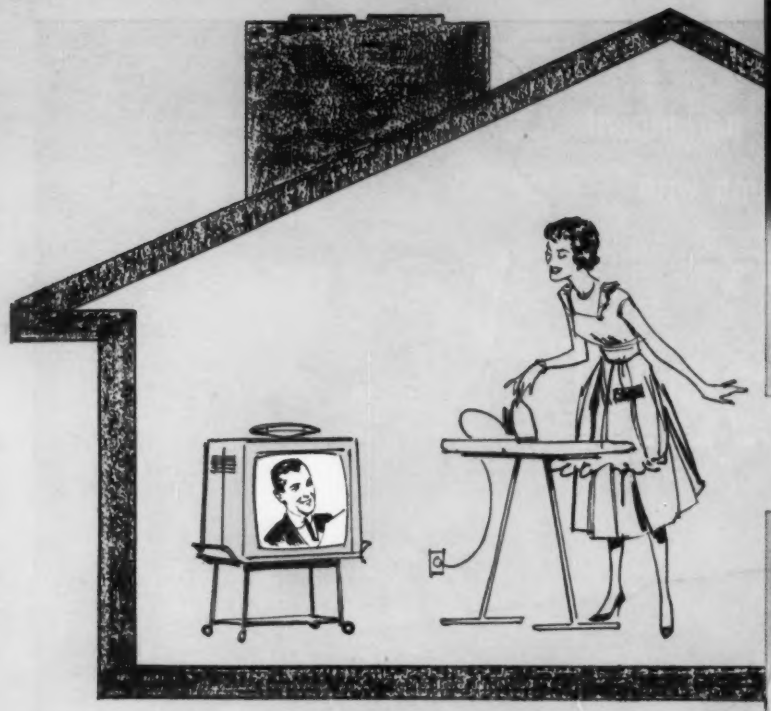


Bert Parks' personality shines in "County Fair."

Bill Cullen emcees the popular "The Price Is Right."

ELECTRIC KITCHEN CARNIVAL SALES WILL BE BIGGER

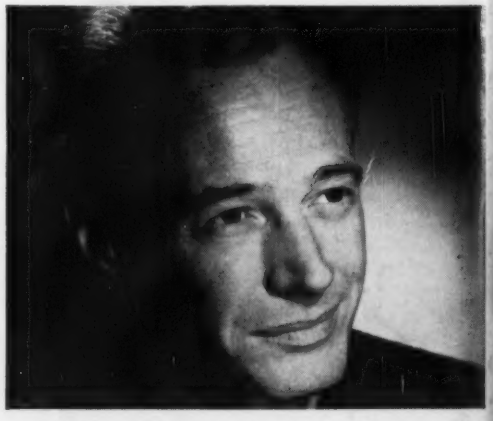
—with the backing of these Network TV salesmen

Three popular daytime TV programs are selling the housewife on the specific benefits of electrical living. It's one more part of EEI's $2.5 million national electric living program.

Arousing the interest of this audience (94% women, who make 85% of store purchases) is the first step toward selling more appliances, lighting and wiring. Daytime TV gives strong local impact and backs up manufacturers' night-time TV shows.

During April-May, the theme, "All-Electric Kitchen Carnival," on these network TV shows will produce added sales for dealers, distributors, contractors, manufacturers *and* electric utilities.

Everyone in the industry stands to benefit from this outstanding electric utility-sponsored program. This advertisement, in support of a campaign for consumer sales, is enthusiastically contributed toward more complete electrical living.



William Prince is seen in "Young Dr. Malone."

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65th year

the year you get more for your transformer dollars

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